

THE SYSTEMATICS OF THE FAMILY STERNOPHORIDAE (PSEUDOSCORPIONIDA)

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ABSTRACT

A systematic revision of the family Sternophoridae is presented. Three genera are recognized: *Garyops* Banks, *Idiogaryops* Hoff and *Afrosterphorus* Beier; the latter is given full generic status. These genera are distinguished solely on the female genitalia. The following generic synonymies are proposed (junior synonym first): *Sternophorus* Chamberlin = *Garyops*; *Sternophorellus* Beier = *Afrosterphorus*; *Indogaryops* Sivaraman = *Afrosterphorus*. The following species are synonymized with *A. ceylonicus* (Beier): *Sternophorus transiens* Murthy and Ananthakrishnan, *S. indicus* Murthy and Ananthakrishnan, *S. montanus* Sivaraman, *S. femoratus* Sivaraman, *S. intermedius* Sivaraman and *Indogaryops amrithiensis* Sivaraman. Four new species are proposed: *Afrosterphorus anabates* (Australia), *A. fallax* (Vietnam), *A. nanus* (Australia) and *A. xalyx* (Australia). *Garyops* contains *depressus* Banks, *sini* (Chamberlin), *centralis* Beier and, possibly, *ferrisi* (Chamberlin). *Idiogaryops* consists of *paludis* (Chamberlin) and *pumilus* (Hoff). *Afrosterphorus* contains *aethiopicus* (Beier), *anabates*, new species, *araucariae* (Beier), *cavernae* (Beier), *ceylonicus* (Beier), *chamberlini* (Redikorzev), *cylindrimanus* (Beier), *dawydoffi* (Beier), *fallax*, new species, *grayi* (Beier), *hirsti*, (Chamberlin), *nanus*, new species, *papuanus* (Beier) and *xalyx*, new species. Two species-groups are proposed in each of the two genera *Idiogaryops* and *Afrosterphorus* to accommodate species with differing trichobothrial numbers. Male genitalia was found to be a useful adjunct to traditional characters, and a detailed description of the male genitalia of *A. hirsti* is presented. Post-embryonic development, biogeography and possible evolutionary pathways are discussed.

INTRODUCTION

Members of the family Sternophoridae are small to medium sized pseudoscorpions that are immediately recognizable by the possession of an extensive pseudosternum, a feature indicated by their family name. Their pale colour and corticolous habits combine to render them comparatively rare in collections.

Six sternophorid genera or subgenera have been described to date, but several inconsistencies in the literature indicate that the generic classification is apparently artificial and in disarray. In particular, authors have relied heavily on the number of chelal trichobothria and the form of the carapace as generic characters, and ignored genitalic features, even though the latter have proved to be extremely valuable in the delimitation of genera in other pseudoscorpion families, such as the Chernetidae. For example, females of

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the Mexican *Sternophorus sini* Chamberlin (the type species of the genus) have genitalia with two spurred, median cribriform plates (Chamberlin 1923, 1931), whereas *S. hirsti* Chamberlin, and other Australian sternophorids have only one unspurred plate. Likewise, females of *Garyops depressa* Banks (the type species of the genus) have two spurred, median cribriform plates (Hoff 1963), whereas *G. pumila* Hoff and *Idiogaryops paludis* (Chamberlin) have two unspurred plates (Hoff 1963). Thus, the present study was aimed at clarifying the taxonomy of this family which appeared to be unreliable, at least as far as the female genitalic characters were concerned.

MATERIALS AND METHODS

Much of the material used in this study was borrowed from overseas institutions which are listed in the Acknowledgments section of this paper. My own material has been lodged in the following depositories (see Acknowledgments for abbreviations): Australian Museum, Sydney (AM); Australian National Insect Collection, Canberra (ANIC); MHNG; MV; Museums and Art Galleries of the Northern Territory, Darwin (NTM); Queensland Museum, Fortitude Valley (QM); and VAM.

My personal accession numbers (e.g. MH237.01) basically follow the system employed by other workers, and are used to refer to the exact specimen upon which diagrams and observations are made. The number to the left of the decimal point refers to the lot number, and the number to the right of the decimal point refers to each individual specimen.

Specimens were examined in two ways, depending on curatorial preferences. Permanent microscope slides were made as follows: specimens were removed from 75% ethanol, an incision was made along one pleural membrane, and the specimens were then cleared overnight at room temperature in 10% potassium hydroxide, dehydrated through a graded ethanol series, and mounted on microscope slides in Euparal (Chroma-Gesellschaft, Schmid GmbH and Co.). One chela of some specimens was dissected off and mounted on a cavity slide to facilitate the inspection of the trichobothrial pattern. Temporary mounts were made by clearing whole specimens in clove oil or lactic acid and mounting on slides in glycerol.

Each specimen was measured with a micrometer eyepiece in a compound microscope, measurements were made in accordance with those discussed by Chamberlin (1931), except for coxa I length (Harvey 1981a) [the "accessory length" of Chamberlin (1931)]. When appendages, especially chelae, were not lying in a horizontal plane, Pythagoras' theorem was employed to determine their true length (Bird et al. 1979). Appendages were often observed to be slightly larger on one side of the body than the other. Hence, measurements were taken from both sides (to the nearest 0.005 mm, except for body length which was taken to the nearest 0.01 mm) to fully record the range of variation.

Benedict and Malcolm (1977) have recently suggested a modified system of reference lines for obtaining accurate measurements of the pedipalpal chela since they found it "nearly impossible to secure reliable measurements of the chela when it remains attached to the palp." They preferred taking measurements from a lateral aspect, rather than a dorsal or ventral one as suggested by Chamberlin (1931). I had no trouble measuring undissected specimens (including large, heavily sclerotized garypids) and Chamberlin's original reference lines are used here. There seems to be a serious lack of uniformity between different workers, and consequently, this makes the comparison between the

different descriptions very difficult. For example, some authors present chelal measurements including the pedicel, whereas others provide them without the pedicel. Mahnert and Muchmore have obviously tried to rectify this problem by providing measurements of the pedicel, but I have found that this is slightly misleading because adding the length of the pedicel to the length of the chela (without pedicel) does not provide the length of the chela (with pedicel). I have followed Chamberlin's (1947 and subsequent papers) system by providing the length of the chela with the pedicel and without the pedicel. Similarly, the ratios of the chela are given with the pedicel and without the pedicel. For the sake of uniformity, all workers should present both of these measurements.

The number of setae within the male genital atrium is given in brackets (e.g. [4-6]), and the number of setae associated with the spiracular plate is shown in parentheses. The abbreviation for a tergal or sternal tactile seta is T. The dimensions of females are in parentheses and follow those of males. The numerator refers to the length of a segment, and the denominator refers to its width.

Drawings were made with the aid of a Leitz camera lucida attached to a Leitz Orthoplan microscope or with a Leitz Prado photographic slide projector with a Prado microscope slide attachment.

The spelling of various southeast Asian localities was found to vary from atlas to atlas, and to differ from the spelling used by Redikorzev (1938) and Beier (1951). Thus, the spelling advocated by the U.S. Board on Geographic Names was adopted in this study (Table 1).

When portions of the locality data were known from published records, but were not present on locality labels, they are shown in brackets.

Abbreviations for chelal trichobothria and cheliceral setae follow those employed by Chamberlin (1931), and are commonly used in pseudoscorpionid literature. Genitalic abbreviations follow Legg (1974b, 1975a), but are listed here for convenience:

aa	anterior apodeme
da	dorsal apodeme
dag	dorsal anterior gland
dmgs	dorsal median genital sac
ejc	ejaculatory canal
ejca	ejaculatory canal atrium
f	foramen
hp	hyaline plate
la	lateral apodeme
lcp	lateral cribriform plate
lgs	lateral genital sac
lr	lateral rod
mcp	median cribriform plate
mgs	median genital sac
pdg	posterior dorsal gland
pvdv	posterior ventral diverticulum
te	testis
vdv	ventral diverticulum

Two females of *Afrosterphorus hirsti* were critical point dried, mounted on points and gold coated for examination in a JEOL JSM-35C Scanning Electron Microscope.

Table 1.—Gazetteer of southeast Asian localities. The first column depicts the spelling used by Redikorzev (1938) and Beier (1951), and the second column shows those used by the U.S. Board on Geographic Names. The latter are used in this paper.

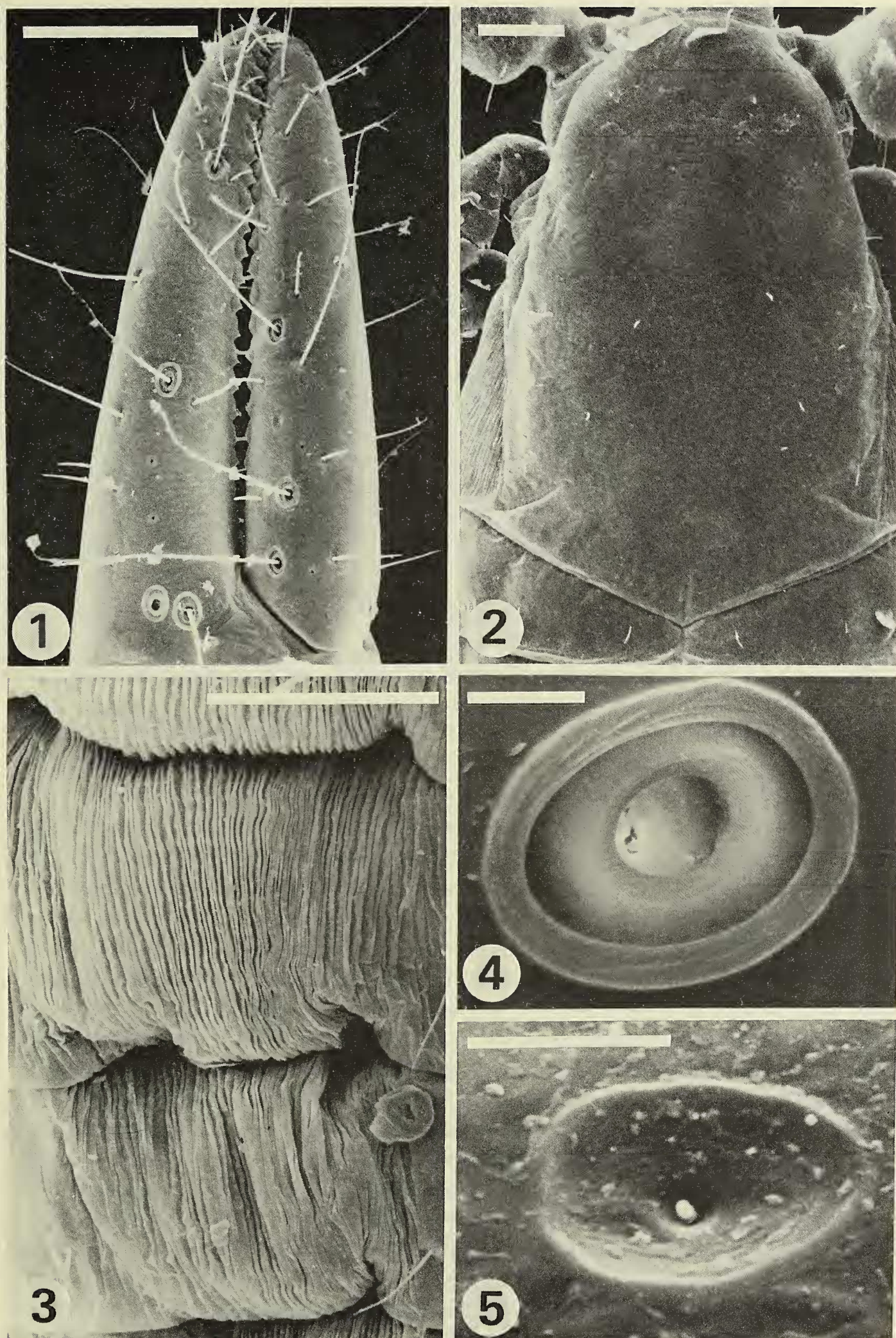
KAMPUCHEA		
Beng Mealea	Phumĭ Boĕng Méalea	13°28'N 104°14'E
Prah Khan	Prasat Preăh Khăn	13°24'N 104°45'E
Phailin	Pailĭn	12°51'N 102°36'E
Rusei Chrum	Roessei Chrum	11°46'N 103°04'E
Sré Umbell	Srê Āmbĕl	11°07'N 103°46'E
Réam	Phsar Ream	10°30'N 103°37'E
LAOS		
Luang Prabang	Louangphrabang	19°52'N 102°18'E
Paclay	Pak-Lay	18°12'N 101°25'E
Plateau von Boloven	Plateau des Bolovens	15°20'N 106°20'E
VIETNAM		
Plateau von Langbian	Cao Nguyên Lâm Viên	12°00'N 108°25'E
Dalat	Da Lat	11°56'N 108°25'E
Arbre-Broyé	Ấp Trăm Hahn	11°51'N 108°34'E
Krongpha	Thôn Sông Pha	11°50'N 108°42'E
Insel Phu-Quoc	Đảo Phú Quốc	10°12'N 104°00'E

FAMILY STERNOPHORIDAE CHAMBERLIN

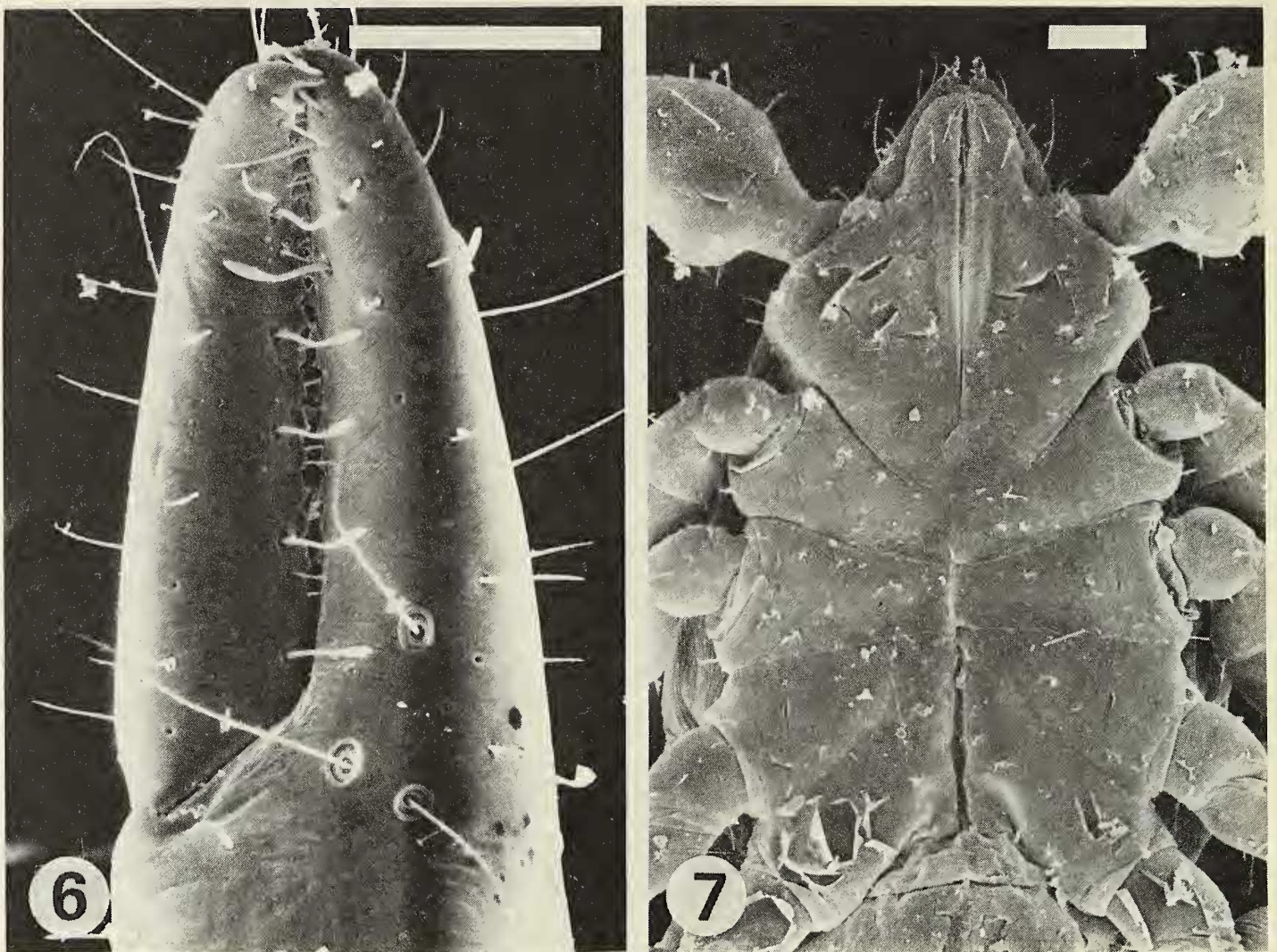
Sternophorinae Chamberlin 1923:370.
Sternophoridae Chamberlin 1931:238, 1932a:140; Beier 1932:15, 1954b:136; Hoff 1956:3, 1963:2;
Murthy and Ananthakrishnan 1977: 117-118; Sivaraman 1981:313.

Diagnosis.—This family may be easily distinguished from other pseudoscorpion families by the extensive pseudosternum (Fig. 10); other supplementary characters include: carapace posteriorly angulate and eyeless (e.g., Fig. 12); venom apparatus present in both chelal fingers (e.g., Fig. 15); accessory teeth absent from chelal fingers (e.g., Fig. 15); legs monotarsate and homofemorate, the junction of the femora perpendicular to the long axis of the leg (Fig. 11); and pedal tarsi without elevated slit sensilla.

Description.—Pedipalps and anterior portion of carapace red brown, terga with pale fuscous stripes, remainder of body pale. Pedipalps, carapace and often legs with striations and ovoid sculpturing. Cheliceral palm with four setae, *ls* absent, *bs* short and blunt (Fig. 9); moveable finger with one subdistal seta; flagellum of four blades, anterior blade very broad and often with several spinules; galea of male always simple, occasionally with one or two small rami; galea of female always with several distinct rami. Carapace posteriorly angulate, eyeless, without transverse furrows, and with a small cucullus and cheliceral condyle. Pedipalpal femur usually with a single, often subbasal, dorsal tactile seta. Fixed chelal finger with seven trichobothria, moveable chelal finger with two or three trichobothria; *eb* and *esb* basal, adjacent, *est* about halfway between *eb* and *et*, *et* subdistal, *ib* and *isb* basal, adjacent, opposite *eb* and *esb*, *ist* about halfway between level of *esb* and *est*, *it* absent, *b* and *sb* subbasal, adjacent, *t* submedial, *st* absent, *sb* sometimes absent; areole shape not unusual (Fig. 4); a long seta usually present slightly proximal to *t*, approximately three quarters the length of a trichobothrium, not arising from a large areole (Fig. 1). Chelal fingers without accessory teeth; each with a mediolateral row of stout, curved, spatulate setae (Fig. 6) (usually more on moveable finger than on fixed finger); and with



Figs. 1-5.—*Afrosternophorus hirsti* (Chamberlin), scanning electron micrographs, females: 1, lateral aspect of right chela, MH474.18; 2, dorsal aspect of carapace, MH474.17; 3, pleural membrane of segments VII-VIII, MH474.17; 4, areole of trichobothrium *sb*, MH474.17; 5, sensory pit slightly anterior to *sb*, MH474.18. Scale lines = 0.1 mm (Figs. 1-3), 0.005 mm (Figs. 4-5).



Figs. 6-7.—*Afrosternophorus hirsti* (Chamberlin), scanning electron micrographs, female, MH474.18: 6, lateral aspect of right chela; 7, ventral aspect of coxal area. Scale lines = 0.1 mm.

several sensory pits, each with a small, blunt seta (Fig. 5). Venom apparatus present in both chelal fingers, nodus ramosus midway between *et* and *est* in fixed finger, and slightly proximal to *t* in moveable finger. Pedal coxae touching in midline (Fig. 7), but with a large medial section that is unsclerotized, thus appearing as a 'pseudosternum' (Fig. 10). Legs homofemorate, junction of the femora perpendicular to the long axis of the leg; femur I always shorter than femur II; tarsi unsegmented, much shorter than tibiae; legs III and IV each with a medial, tibial tactile seta and a proximal, tarsal tactile seta (Fig. 11); tarsi without elevated slit sensilla; arolia shorter than claws. Abdominal terga and sterna not medially divided. Pleural membrane longitudinally striate (Fig. 3). Spiracles situated within pleural membrane; anterior pair of tracheae fairly long, ramifying into tracheoles when above the third or fourth coxae; posterior pair of tracheae very short, branching almost immediately (Fig. 10). Male genitalia described in detail below. Female genitalia with one or two median cribriform plates, with or without spurs, and with one pair of lateral cribriform plates. Spermathecae absent. Tergum and sternum X each with two pairs of lateral tactile setae. Tergum and sternum XI fused, with several tactile setae (because of this fusion, these setae are difficult to count with accuracy, and are simply referred to in the species descriptions with '?'). Anus terminal, anal plate oval.

Type genus.—*Garyops* Banks 1909 (= *Sternophorus* Chamberlin 1923).

Remarks.—The Sternophoridae is a remarkably uniform group that presents few characters for its subdivision. Previous authors have utilized only external morphological characters to delimit genera. These characters are insufficient to divide the family into monophyletic genera. They are discussed in detail below:

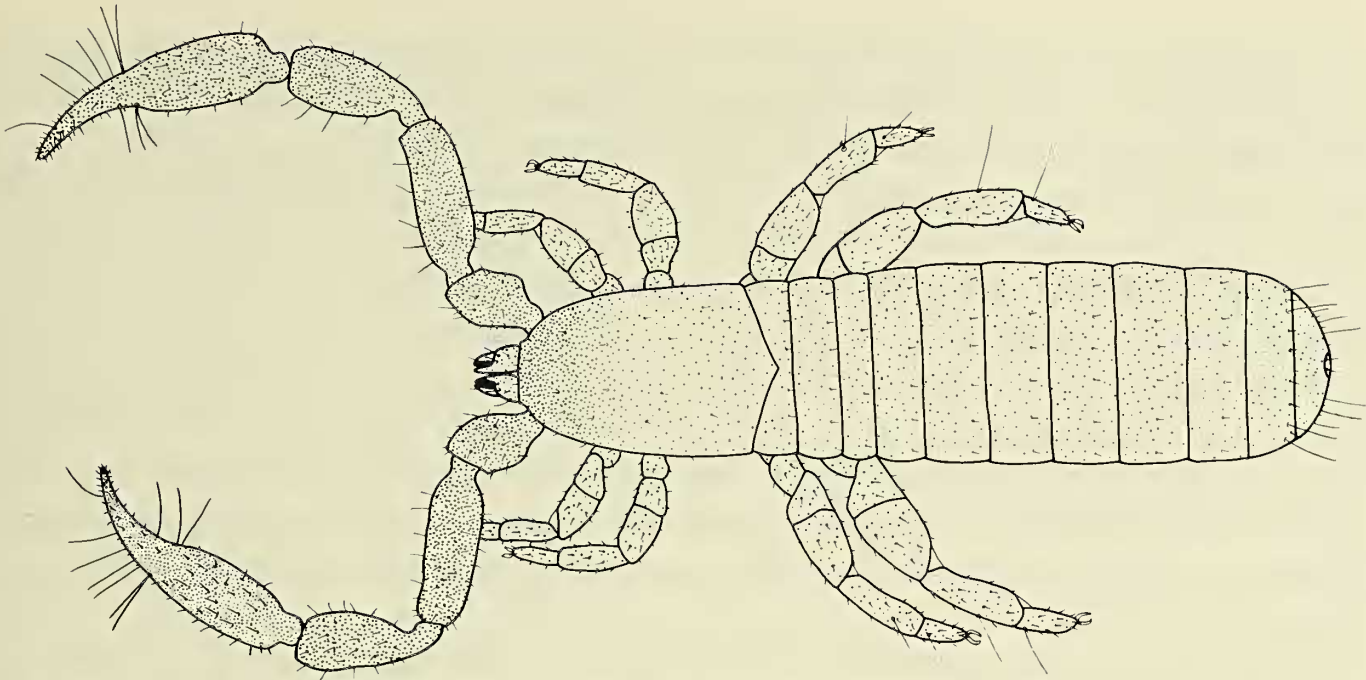


Fig. 8.—Dorsal aspect of *Afrosternophorus anabates*, new species, male holotype.

(1) Anterior constriction of the carapace: The degree of constriction of the carapace has been utilized as a major generic character by previous authors ever since Chamberlin [1931: based on Banks' (1909) misleading description of *Garyops depressus*] separated *Garyops* and *Sternophorus* on the presence or absence, respectively, of this constriction. This study has revealed that a constriction is indeed present in *S. sini* (the type species of the genus) and that the two genera cannot be separated by this criterion. Furthermore, intraspecific variation has been observed in several species, most notably in *Afrosternophorus dawydoffi*; some specimens possess no constriction (Fig. 95), others possess a slight constriction (Fig. 96), and others display a distinct constriction (Fig. 97). Generally, it appears that the degree of constriction is related to the overall size of the animal. The larger species such as *A. dawydoffi*, *Garyops* spp. and *Idiogaryops pumilus*, and to a lesser extent, *I. paludis*, *A. anabates* and *A. ceylonicus*, often possess a constriction, whereas the smaller species (the remaining *Afrosternophorus* species) do not possess this constriction. Clearly then, this character is too variable to be given serious consideration as a valid generic character.

(2) Cucullus: The subgenus *Afrosternophorus* and the genus *Indogaryops* were characterized by their authors, Beier (1967) and Sivaraman (1981), respectively, as possessing a distinct cucullus. This study has revealed that all sternophorids possess a cucullus, and therefore, it must be rejected as a valid generic or subgeneric character.

(3) Absence of trichobothrium *sb*: *Idiogaryops* and *Sternophorellus* were separated from other genera by the possession of only two trichobothria on the moveable chelal finger. The type species of these two genera, *I. paludis* and *S. araucariae*, are, in all other respects, very similar to species which possess three trichobothria on this finger. The relative position of *b* and *t* of all species is the same and the only difference that can be found is the absence of *sb*. To retain different genera for species which lack one or more trichobothria has clearly extended the generic system and obscured obvious affinities. Thus, the generic limits of the sternophorid genera are herein extended to include species with either two or three trichobothria on the moveable chelal finger. Nevertheless, in accordance with the importance that is placed on trichobothria in pseudoscorpion taxonomy, two species groups in each of two genera, *Idiogaryops* and *Afrosternophorus*, have been erected to accommodate species with different trichobothrial numbers.

Many other pseudoscorpion genera are known to include species with varying numbers of trichobothria. These include *Geogarypus* Chamberlin (Chamberlin 1930, Harvey, unpublished observations), *Synsphyronus* Chamberlin (Chamberlin 1943, Harvey, in press), *Larca* Chamberlin (Hoff 1961), *Eremogarypus* Beier (Beier, 1962, 1973a), *Anagarypus* Chamberlin (Muchmore 1982a) and *Thaumastogarypus* Beier (Mahnert 1982b), the vachoniid *Paravachonium* Beier (Muchmore 1982b), the cheiridiid *Neocheiridium* Beier (Mahnert 1982a) and the chernetid *Parachernes* Chamberlin (Muchmore and Alteri 1974). More detailed analyses of other generic complexes may well yield further genera whose trichobothrial numbers vary. Indeed, a perusal of the literature reveals that many African garypid genera are extremely similar, and that the North American garypids *Larca* and *Archeolarca* Hoff and Clawson are probably synonymous. Furthermore, the *Solinus-Aldabrinus* complex (Olpidae) contains several genera that may eventually prove to be synonymous.

(4) Cheliceral setation: Hoff (1963) stated that the cheliceral seta *sbs* was absent in *Garyops* and *Idiogaryops*. Chamberlin (1931) indicated that *ls* was the missing seta in *Sternophorus*, and Murthy and Ananthakrishnan (1977) utilized this apparent difference to separate *Sternophorus* from the former genera. In fact, the cheliceral setation of all sternophorids is identical, and it is contended here that *ls* is the missing seta.

Thus with all of the traditional characters discarded, only the genitalic characters were found to be of any use at the generic level. Three genera are recognized herein: *Garyops*, *Idiogaryops* and *Afrosterphorus*. Females of *Garyops* and *Idiogaryops* possess two median cribriform plates and females of *Afrosterphorus* possess only one. Furthermore, females of *Garyops* possess lateral spurs on these plates. The generic synonymies are discussed and justified under the relevant genera.

The genus name *Garyops* has clearly been treated as feminine by Banks (1909) and subsequent authors, but Article 30a(i)(2) of the International Code of Zoological Nomenclature [as amended by the Commission in 1972 (Bull. Zool. Nomen., 29:182)] unequivocally states that a "genus-group name ending in *-ops* is to be treated as masculine regardless of its derivation or of its treatment by its original author." Only two names are affected by this rule in the genera *Garyops* and *Idiogaryops*: *depressa* and *pumila* are converted to *depressus* and *pumilus*, respectively.

AFFINITIES OF THE STERNOPHORIDAE

Opinions of the taxonomic position of the Sternophoridae have varied over the years. Chamberlin (1931) placed it with the Cheiridiidae and Pseudochiridiidae in the superfamily Cheiridioidea on the grounds that all three possess homofemorate legs. Beier (1954b) transferred it to the Cheliferoidea, allying it to the Goniochernetinae, when he found that *Goniochernes goniothorax* (Redikorzev) possesses not only a posteriorly angulate carapace (Beier 1932), but also a 'pseudosternum', features characteristics of the Sternophoridae. As discussed in the familial description, the 'pseudosternum' of all sternophorids is not a gap between the coxae, but a large unsclerotized region roughly in the center of the coxal area. However, the 'pseudosternum' of the goniochernetines, at least in the Australian representatives that I have examined [*Calymmachernes angulatus* Beier, *Conicochernes brevispinosus* (L. Koch), *C. crassus* Beier, *C. incrassatus* (Beier) and *C. spp.*], is an actual space between the coxae [as described by Beier (1954a) for

Calymmachernes angulatus], there being no translucent cuticle. Other chernetids examined by me, including *Chernes cimicoides* (Fabricius) and *C. hahni* (C. L. Koch), also have a small gap between coxae II and III, which often extends to coxae IV. Thus, the sternophorid pseudosternum and the gap of the Chernetidae are quite different structures and cannot be regarded as homologous.

Where, then, do the relationships of the Sternophoridae lie? The similarity to the goniochernetines can hardly be gainsaid, at least as regards the posteriorly angulate carapace, but I consider that the Goniochernetinae truly belongs in the Chernetidae and is unrelated to the Sternophoridae. Characters supporting this contention include: (1) elevated slit sensillum present on all pedal tarsi (absent in Sternophoridae); (2) venom apparatus present in moveable chelal finger only (present in both fingers in Sternophoridae); (3) chelal fingers with accessory teeth (accessory teeth absent in Sternophoridae); and (4) females with spermathecae (without spermathecae in Sternophoridae). The first three characters are considered by Muchmore (1973) to be diagnostic of the Chernetidae. Other characters include the grouping of the setae on the genital opercula (usually compact in Chernetidae; not so in Sternophoridae), the suture of the pedal femora (oblique in Chernetidae; perpendicular in Sternophoridae), the form of the male genitalia, which, although hard to define, is "chernetid-like" in the Chernetidae, quite unlike the relatively simple genitalia of the Sternophoridae, and the presence (Chernetidae) and absence (Sternophoridae) of a medial division of the abdominal terga and sterna (W. B. Muchmore, pers. comm.).

Therefore, I concur with Heurtault (1983) that the Sternophoridae is not closely related to the Goniochernetinae. This does not solve the problem of which superfamily they belong to, and I consider that the placement of the Sternophoridae into either the Cheiridioidea or the Cheliferoidea is a conjectural matter which cannot be resolved at present. Further research into areas such as male genitalia may lead to a more stable classification.

GENITALIA

Pseudoscorpion genitalia have not been frequently studied, but the recent papers by Legg (1973, 1974a, b, c, 1975a, b, c) have allowed for a comprehensive understanding of the complex morphology of many British species of the order.

As shown in the taxonomic section, the three sternophorid genera are distinguishable by female genitalic characters alone. Furthermore, the male genitalia often delimit taxa at the specific level.

Female genitalia.—The most obvious structures are the cribriform plates, which are porous plates of unknown function (Legg 1974c). All taxa possess one pair of lateral cribriform plates (*lcp*) (e.g., Fig. 16). One genus, *Afrosterophorus*, also possesses one median cribriform plate (*mcp*) (e.g., Fig. 85), whereas *Idiogaryops* and *Garyops* possess two (e.g., Figs. 16, 45). Furthermore, the latter possesses a unique pair of lateral spurs or projections on these plates (e.g., Fig. 16). The significance or function of these spurs is unknown, and the study of them may be of extreme interest.

Spermathecae are present in most "higher" families such as the Cheliferidae, Chernetidae and Atemnidae (Chamberlin 1931), yet are absent or significantly reduced in the Chthoniidae, Neobisiidae and Cheiridiidae (Legg 1975b, c). Detailed examination of all sternophorid genera revealed an absence of spermathecae. The "spermathecae" of *Garyops sini* figured by Chamberlin (1931: Fig. 52o, as *Sternophorus sini*) are, in fact, the median glands (cf. Legg 1974c: Fig. 1).

Male genitalia.—The male genitalia of pseudoscorpions consist of a complex series of sclerotized apodemes and rods, which serve as attachment sites for muscles and as support for the genital atrium (Legg 1975a). As shown in the taxonomic section, the morphology of the male genitalia was often seen to vary significantly at the species level. Given this variation, and the fact that male sternophorid genitalia have not been studied in detail before, a relatively comprehensive account of the armature and glands is presented. Although the genital armature was examined in every species in which males were known, the soft portions were examined only in *Afrosterphorus hirsti* (Chamberlin) (Fig. 51).

Chamberlin (1923) figured the male genitalia of *Garyops sini* (as *Sternophorus sini*), but my observations on material of this species indicate that his diagram is not entirely accurate. Chamberlin (1932a) noted that he could distinguish between the four sternophorid species known to him, but refrained from quantifying these differences.

All nomenclature follows that of Legg (1975a), but is presented in the Materials and Methods for convenience.

(1) Genital opercula and aperture: As with all pseudoscorpions (Legg 1975a), the anterior and posterior genital opercula are formed from the opisthosomal sternites II and III. An invagination between these plates forms the genital atrium. Within this atrium are several (2-8) small setae. The genital aperture is relatively small, as in most of the Monosphyronida.

(2) Genital armature: Associated with the genital atrium are a series of apodemes and rods which constitute the genital armature (Legg 1975a). The lateral apodeme (*la*) extends laterally and sometimes may be curved anteriorly; these apodemes meet in the midline. Arising anteriorly from the dorsal portion of the armature of some species is an anterior apodeme (*aa*). This varies considerably in shape and size, and in *A. hirsti* it is brush-like (Fig. 56). The paired dorsal apodemes (*da*) are usually elongate and acute, but several species (in two genera) show various modifications in size and shape. Between the dorsal apodeme and the lateral apodeme is a clear area of cuticle, here termed the hyaline plate (*hp*). It is often difficult to observe except under high magnification and strong illumination. The lateral rod (*lr*) forms a complete circle, and is often broadest ventrally. It possesses a ventral midpiece that is often terminally bifurcate. The lateral rod often may lie anterior to the genital armature, and thus give a totally different appearance to the genitalia. Such a situation occurs in *A. aethiopicus* (Beier) (Fig. 52), *A. ceylonicus* (Beier) (Fig. 53) and *Idiogaryops* sp. (Fig. 33). Although it may represent distortion arising during the slide making process, it appears that this is not the case, because the many spirit preserved specimens of *A. ceylonicus* that I have examined all possess this condition. Often one, or sometimes two, foramina (*f*) occur in the area where the lateral rod and lateral apodeme fuse. Some species of *Garyops* and *Idiogaryops* also possess a foramen where the lateral apodemes join.

(3) Accessory glands, genital sacs and ventral diverticula: Extending posteriorly from the genital armature is the posterior dorsal gland (*pdg*). As noted by Legg (1975a), it occurs in all pseudoscorpion families that have been examined. Lying anterior to the genital armature is the dorsal anterior gland (*dag*); this gland is bilobed in most pseudoscorpions, yet is absent in the Cheiridiidae (Legg 1975a). The single lobed structure found in sternophorids may be an intermediate stage, but much more work needs to be completed before such a statement can be verified. Ventral anterior glands are not present.

A pair of lateral genital sacs (*lgs*) originate from the distal ends of the lateral apodemes. A bilobate median genital sac (*mgs*) lies posterior to the genital armature, and is

connected to the posterior ventral diverticulum (*pvdv*) via the long, thin duct of the median genital sac (*dmgs*). The ventral diverticulum (*vdv*) is semicircular, and the anterior edge is often gently sinuate.

(4) Testis, ejaculatory canal atrium, and ejaculatory canal: The testis (*te*) extends posteriorly into the abdomen and terminates bluntly. The ejaculatory canal atrium (*ejca*) is cup-shaped and lies anterior to the genital armature. It is connected to the genital atrium by the ejaculatory canal (*ejc*).

POST-EMBRYONIC DEVELOPMENT

Pseudoscorpions characteristically possess four post-embryonic stages, termed protonymph, deutonymph, tritonymph and adult. Apart from the obvious fact that each stage is slightly larger than the preceding one, the only other apparent differences are the increase in the number of setae and the development of genitalia at the final moult. It is the first difference that will be addressed now, since the acquisition of genitalia (or, at least, the sclerotized portions) is apparently confined to the final moult, and does not exhibit sequential development. In particular, the number of cheliceral setae and chelal trichobothria will be examined.

Cheliceral setae.—Little may be said concerning the development of the cheliceral setae, except that protonymphs differ from the adult and remaining nymphal stages by lacking *gs*.

Chelal trichobothria.—The chelal trichobothria of pseudoscorpions are added sequentially during their ontogeny, and provide a means for recognizing the three nymphal stages (Vachon 1934). Vachon (1936) found that for species in which adults possess eight trichobothria on the fixed chelal finger and four trichobothria on the moveable chelal finger (herein abbreviated to 8/4), the nymphal complement was 3/1 for protonymphs, 6/2 for deutonymphs, and 7/3 for tritonymphs. This has subsequently been confirmed for many genera of most pseudoscorpion families, even though different trichobothria may be added at each moult (Mahnert 1981). Furthermore, Vachon (1936) and Nelson (1982) have found that even though adults of *Microbisium dumicola* (C. L. Koch) and *M. confusum* Hoff (Neobisiidae), respectively, possessed a reduced trichobothrial complement of 7/3, the nymphs retained a complement typical of those species whose adults possessed 8/4. [Beier (1963) and Gabbut (1969) have expressed doubt as to the validity of *M. dumicola* and Vachon's material may belong to a different species].

Adults of all known sternophorid species possess a reduced complement of either 7/3 (*Garyops* spp., *Idiogaryops pumilus* species group and *Afrosterphorus aethiopicus* species group) or 7/2 (*I. paludis* species group and *A. araucariae* species group). Unfortunately, the nymphal stages of only four sternophorid species are known. The first observations were made by Murthy and Ananthakrishnan (1977: Fig. 40B), who demonstrated that tritonymphs of *A. ceylonicus* (as *Sternophorus transiens*) possessed 7/2, whereas the adults possessed 7/3. This situation can now be confirmed in three other species of the *aethiopicus* species group, *A. hirsti*, *A. nanus* and *A. anabates*. Furthermore, the deutonymphs of the former species and the protonymphs of *hirsti* and *anabates* are known. Following the format of Vachon (1936) and Gabbut and Vachon (1965, and subsequent papers), the order in which the trichobothria are added at each moult in *A. hirsti* (the only species for which all nymphal stages are known) is summarized in Table 2. Following the format of Vachon (1973), it may be summarized as follows, where the

Table 2.—The order in which trichobothria are added at each moult in *Afrosterphorus hirsti* (Chamberlin).

	protonymph	deutonymph	tritonymph	adult
moveable finger series	<i>t</i>	<i>b</i>	—	<i>sb</i>
fixed finger, external series	<i>eb, et</i>	<i>est</i>	<i>esb</i>	—
fixed finger, internal series	<i>ib</i>	<i>isb, ist</i>	—	—

stage at which a certain trichobothrium appears is shown as a subscript (A = adult, N3 = tritonymph, N2 = deutonymph, N1 = protonymph):

$$t_{N1} \text{ } st \text{ } sb_A \text{ } b_{N2}/et_{N1} \text{ } est_{N2} \text{ } esb_{N3} \text{ } eb_{N1}/it \text{ } ist_{N2} \text{ } isb_{N1} \text{ } ib_{N2}$$

Notwithstanding the absence of *st* and *it*, this is similar to Mahnert’s (1981) pattern for the Cheliferinea (Monosphyronida), to which the Sternophoridae currently belongs.

The reduced trichobothrial complement of all sternophorids makes it difficult to ascertain which trichobothria are absent. My interpretation that *it* and *st* are the missing trichobothria may need modification as our knowledge of pseudoscorpion trichobothriotaxies increases.

Although *A. hirsti* is the only sternophorid species to be studied in detail, there is no reason to assume that the situation will be any different for the other species whose adults possess 7/3. The nymphs of those species which possess a reduced adult complement of 7/2 (*I. paludis*, *A. araucariae*, *A. cavernae*, *A. fallax* and *A. xalyx*) will probably possess a slightly different pattern.

KEY TO GENERA OF STERNOPHORIDAE

- 1. Females with two median cribriform plates 2
Females with one median cribriform plate *Afrosterphorus* Beier
- 2. Female median cribriform plates with a pair of lateral spurs. *Garyops* Beier
Female median cribriform plates without lateral spurs *Idiogaryops* Hoff

Genus *Garyops* Banks

Garyops Banks 1909:305 (in part); Chamberlin 1931:238 (in part); Beier 1932:18 (in part); Hoff 1963:2-3 (in part). Type species by original designation and monotypy *Garyops depressus* (pro *depressa*) Banks 1909.
Sternophorus Chamberlin 1923:371, 1931:238-239; Beier 1932:16 (in part); Murthy and Ananthakrishnan 1977:18 (in part). Type species by original designation and monotypy *Sternophorus sini* Chamberlin 1923. NEW SYNONYMY.

Distribution.—Dominican Republic; El Salvador; Mexico; Florida, U.S.A. (Map 1).
Diagnosis.—Females with two spurred, median cribriform plates. Fixed chelal finger with seven trichobothria, moveable chelal finger with three trichobothria.
Subordinate taxa.—*Garyops depressus* Banks, *G. sini* (Chamberlin), *G. centralis* Beier, *G. (?) ferrisi* (Chamberlin).
Remarks.—Chamberlin (1931) separated *Garyops* and *Sternophorus* on the presence or absence, respectively, of an anterior constriction of the carapace. The degree of narrowing



Map 1.—North America showing known distribution of *Garyops depressus* Banks (circles), *G. sini* (Chamberlin) (squares), *G. centralis* Beier (triangle) and *G. (?) ferrisi* (Chamberlin) (star) (state record only). Open symbols represent literature records only.

in *G. depressus* was unknown to Chamberlin, and he overlooked the slight constriction evident in *S. sini*, the type species of *Sternophorus*. This study has revealed that the form of the carapace of the two genera is not different, and furthermore, that females of both genera possess unique spurs on the median cribriform plates. On this basis, *Garyops* and *Sternophorus* are here synonymized. Hoff (1949, 1963) and Hoff and Bolsterli (1956) suggested that the two genera may be identical, yet refrained from formally synonymizing them.

Garyops depressus Banks
Figs. 9-16, 28, 34, 39; Map 1

Garyops depressa Banks 1909:305-306 (in part); Beier 1932:18; Hoff 1958:19, 1963:4-7, Figs. 1-4; Beier 1976:46; Brach 1979:34-38.
nec *Garyops depressa* Banks: Hounscome 1980:85 (misidentification).

Types.—Lectotype female (designated by Hoff 1963:4), paralectotype male, paralectotype female, Punta Gorda, Charlotte County, Florida, U.S.A., date? [A. T. Slosson], MCZ (slides and spirit).

Distribution.—Florida, U.S.A.; Dominican Republic (Map 1).

Diagnosis.—Female galea with three distal rami. Male genitalia with long, acute, dorsal apodemes. Chela (with pedicel) 0.97 to 1.18 (male), 1.015 to 1.19 mm (female) in length, 3.96 to 4.44 (male), 3.78 to 4.37 (female) times longer than broad.

Description.—Supplementary to Hoff (1963). Chela (with pedicel) 3.96 to 4.44 (male), 3.78 to 4.37 (female) times longer than broad. Carapace (Fig. 12) 1.23 to 1.38 (male), 1.34 to 1.35 (female) times longer than broad. Male genitalia (Fig. 28) with long, acute, dorsal apodemes.

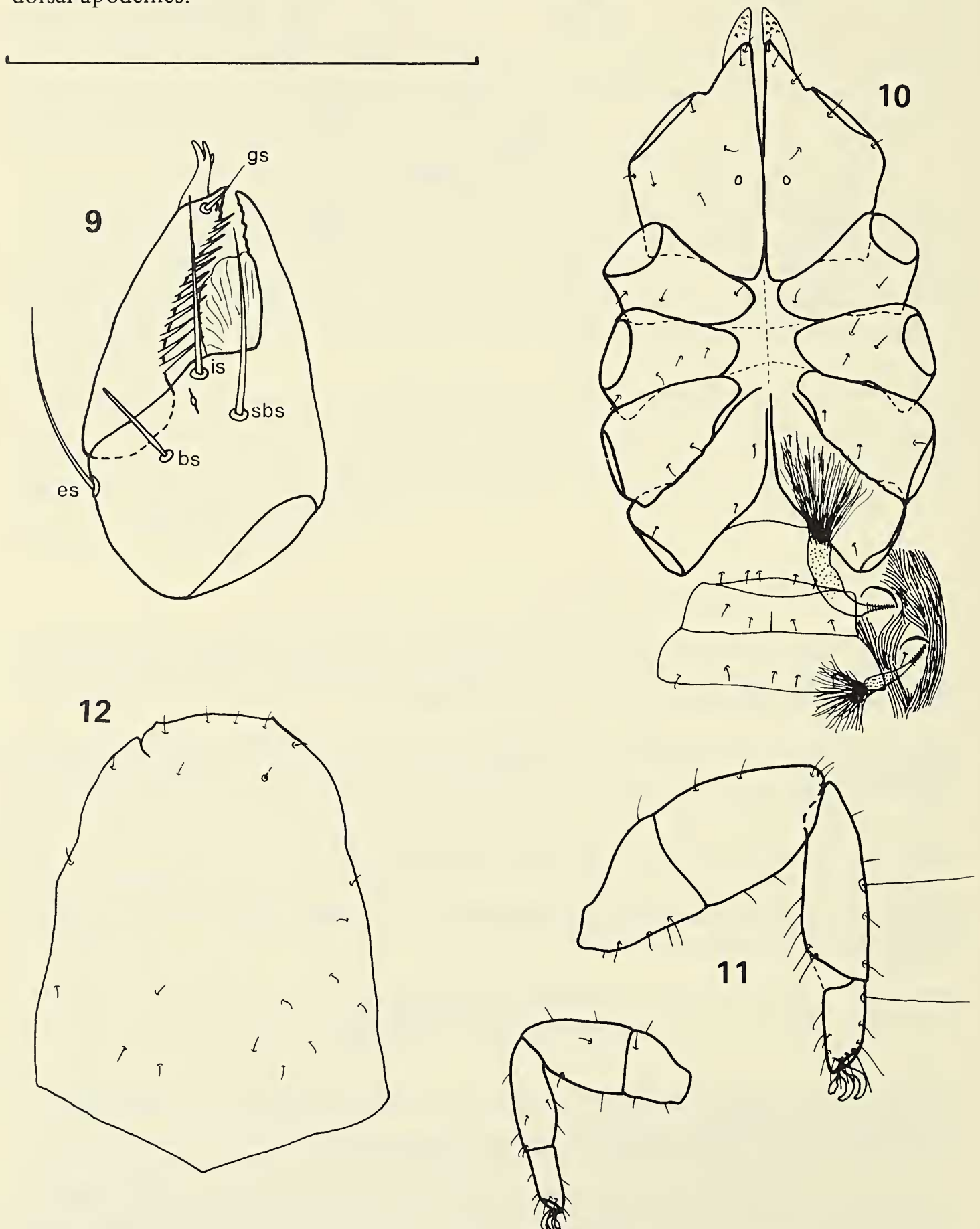
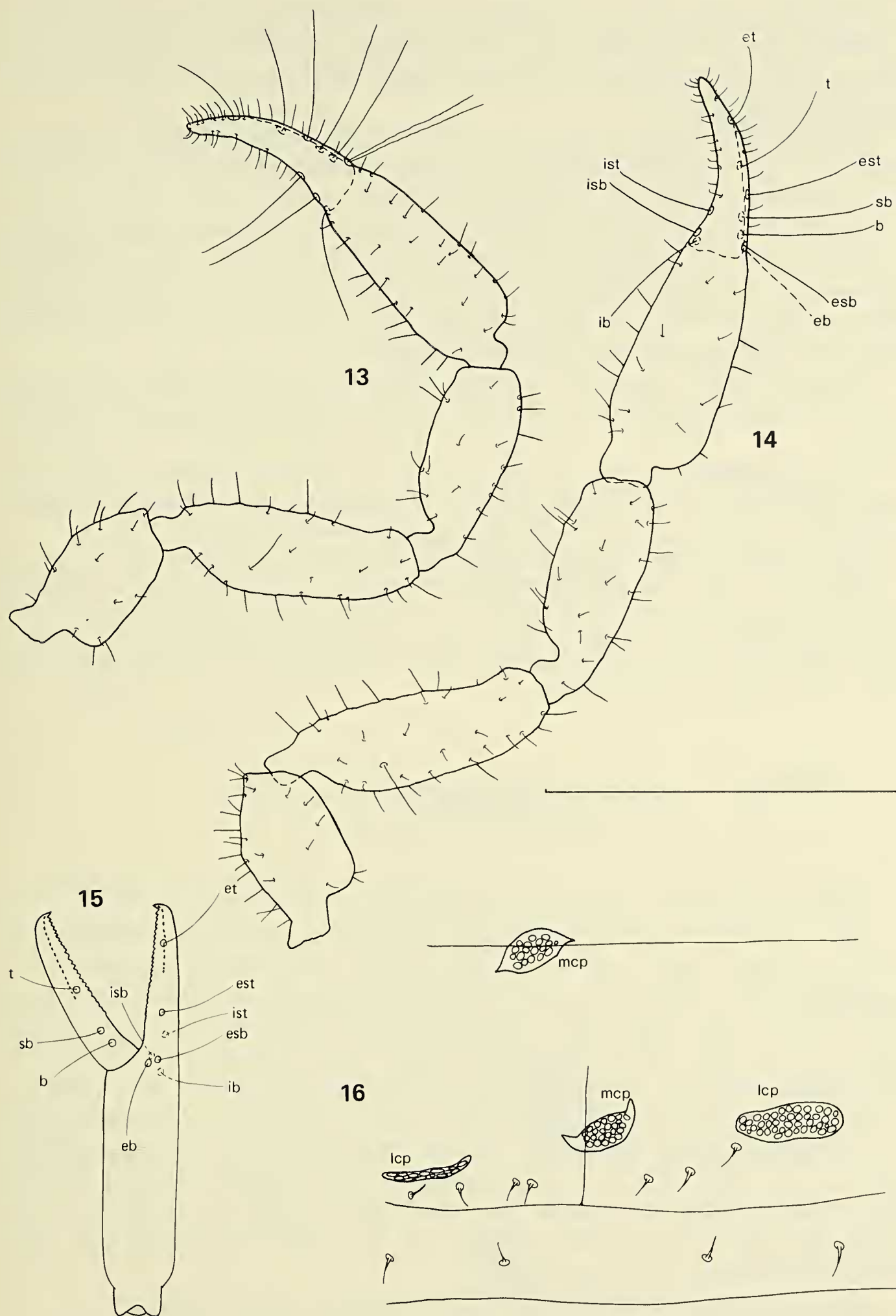


Fig. 9-12.—*Garyops depressus* Banks: 9, dorsal aspect of left chelicera, female, S-2840.1; 10, ventral aspect of coxal area, with left tracheae, male, S-2792.4; 11, leg I and leg IV, male, S-2782.2; 12, dorsal aspect of carapace, male, S-2792.4. Scale line = 1.00 mm (Figs. 10-12), 0.25 mm (Fig. 9).



Figs. 13-16.—*Garyops depressus* Banks: 13, dorsal aspect of right pedipalp, male, S-2782.2; 14, same, female, S-2829.2; 15, lateral aspect of left chela, female, S-2829.2; 16, female genitalia and associated sternites, S-2829.2. Scale line = 1.00 mm (Figs. 13-15), 0.25 mm (Fig. 16).

Dimensions (mm): Chela (with pedicel) 0.97-1.18/0.245-0.28 (1.015-1.19/0.26-0.30).

Habitat.—Hoff (1963) and Brach (1979) discussed the habitat preferences of this species, and all the specimens (with known habitat data) have been taken from under bark of *Pinus elliotti*.

Remarks.—Hoff (1963) adequately redescribed this species, and little needs to be added here except for details of the male genitalia, measurements of the chela including the pedicel, and carapaceal ratios, which were omitted in Hoff's paper.

Hoff examined three of Banks' syntypes, and found that two females were referable to *G. depressa*, whereas the third female belonged to his new species *G. pumila* (herein transferred to the genus *Idiogaryops*). I have had the opportunity to examine the other three syntypes and found that one male belongs to *G. depressus*, whereas the other two specimens, a male and a female, belong to *I. pumilus*.

Hounscome (1980) recorded *G. depressus* from Little Cayman Island based upon Prof. Beier's identification. I have been able to examine this material, and it is clearly *I. pumilus*.

Garyops depressus is extremely similar to *G. sini*, and they eventually may be considered synonymous. They are retained here as separate species on the basis of the slightly larger size of *G. depressus*, even though there is considerable overlap (Fig. 39).

Other specimens examined.—DOMINICAN REPUBLIC: Bani (65 m), 24 September 1972 (J. and S. Klapperich), 5 males, 3 females (MHNG) (spirit). U.S.A.: FLORIDA; *Highlands Co.*, Archbold Biological Station, under bark of *Pinus elliotti*, 7 April 1956 (C. C. Hoff), 1 male (AMNH, S-2782.2) (slide). Same data as above except 10 April 1956, 1 male (AMNH, S-2792.4) (slide). Same data as above except 15 April 1956, 1 female (AMNH, S-2829.2) (slide). Same data as above except 16 April 1956, 1 female (AMNH, S-2840.1) (slide).

Garyops sini (Chamberlin), new combination

Figs. 17-21, 29, 35, 39; Map 1

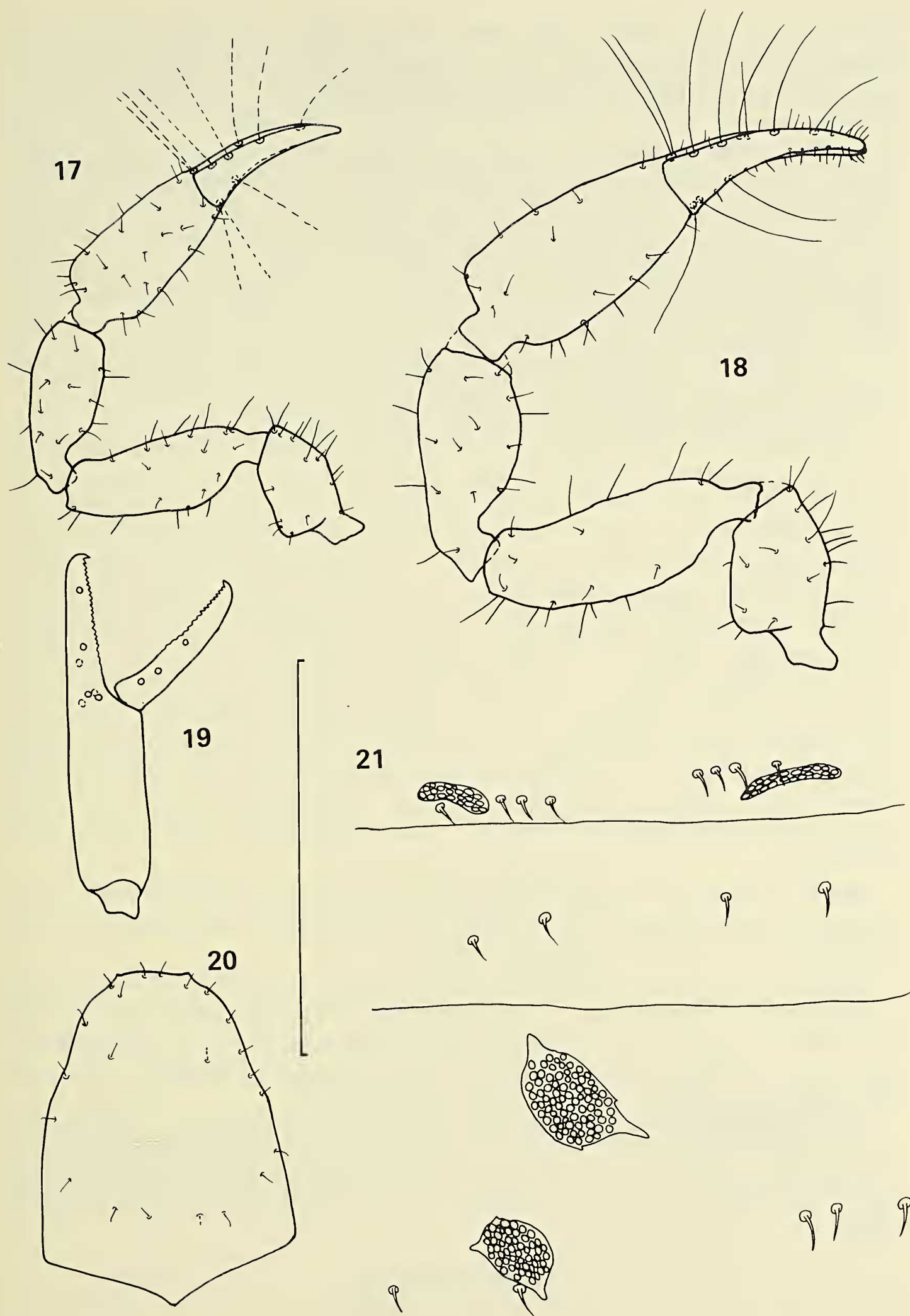
Sternophorus sini Chamberlin 1923:371-372, Plate 1, Fig. 6, Plate 2, Fig. 21, Plate 3, Figs. 6, 15, 22-25, 1931:192, 239, Figs. 4d, 10c, 11z, 20f, 52o-q, 67, 1932a:142; Beier 1932:17, Figs. 11-12.

Types.—Holotype male, paratype female (designated as allotype by Chamberlin), SE corner of Tiburon Island, Gulf of California, Mexico, under bark, 4 July 1921 (J. C. Chamberlin), CAS, Type Nos. 1286, 1287 (slides). Paratype male, paratype female, same data as above except under bark of mesquite, JCC, JC-183.02003-4 (slides). Paratype male, paratype female, same data as above except date? (collector?, presumably J. C. Chamberlin), NHMW, JC-344.01003-4 (spirit). Paratype female, Palm Canyon, Angel de la Guarda Island, Gulf of California, Mexico, 3 May 1921 (J. C. Chamberlin), JCC, JC-167.02001 (slides). Paratype male, paratype female, Los Angeles Bay, Baja California, Mexico, 25-27 June 1921 (J. C. Chamberlin), JCC, JC-176.04001-2 (slides). Paratype male, paratype female, Las Animas Bay, Baja California, Mexico, 8 May 1921 (J. C. Chamberlin), JCC, JC-714.01001-2 (slides). The type series also included many other specimens which were not examined.

Distribution.—Baja California, Gulf of California, Sonora, Mexico (Map 1).

Diagnosis.—Female galea with three distal rami. Male genitalia with long, acute dorsal apodemes. Chela (with pedicel) 0.835 to 0.935 (male), 0.86 to 1.14 mm (female) in length, 3.80 to 4.00 (male), 3.54 to 3.81 (female) times longer than broad.

Description.—Pedipalpal trochanter large and inflated, 1.95 to 2.05 (male), 1.79 to 2.10 (female), femur 2.77 to 3.05 (male), 2.68 to 3.05 (female), tibia 2.31 to 2.45



Figs. 17-21.—*Garyops sini* (Chamberlin): 17, ventral aspect of right pedipalp, male paratype, JC-176.04001; 18, same, female paratype, JC-167.02001; 19, lateral aspect of right chela, female paratype, JC-714.01002; 20, dorsal aspect of carapace, female paratype, JC-176.04002; 21, female genitalia and associated sternites, paratype, JC-167.02001. Scale line = 1.00 mm (Figs. 17-20), 0.25 mm (Fig. 21).

(male), 2.11 to 2.35 (female), chela (with pedicel) 3.80 to 4.00 (male), 3.54 to 3.81 (female), chela (without pedicel) 3.59 to 3.84 (male), 3.35 to 3.61 (female) times longer than broad. Trichobothria as for genus, in usual position (Figs. 17-19). Serrula exterior of chelicera with 10 to 12 (male, female) lamellae. Two males (JC-176.04001, JC-714.01001) possess an extra gs on the moveable fingers of their chelicerae. Galea of male simple, of female with three distal rami, one usually smaller than the others (Fig. 35). Carapace anteriorly constricted (Fig. 20) with 25 (male), 20 to 32 (female) setae; 1.34 to 1.41 (male), 1.35 to 1.48 (female) times longer than broad. Male genitalia with long, acute dorsal apodemes (Fig. 29). Female genitalia as for genus (Fig. 21); some females possess extra, smaller projections on the median cribriform plates. Tergal chaetotaxy: male, 6:5-6:4-5:5:4-6:5:5-7:5-6:6:T1T4T1T:?:2; female, 6-7:5-6:3-6:4-6:4-6:4-8:5-7:5-6:T1T3-4T1T:?:2. Sternal chaetotaxy: male, 0:4-7:(0)4[2](0):(1)3-6(1):6-7:5-8:5-6:6:6:T1T4T1T:?:2; female 0:3-9:(0)3-4(0):(1)4-7(1):4-8:5-8:5-8:6-8:5-8:T1T4T1T:?:2. Coxal chaetotaxy: male, 4-5:3-5:3-5:3-5; female, 3-6:3-6:2-5:3-4.

Dimensions (mm): Body length 2.1-2.4 (2.4-3.8); pedipalps: trochanter 0.36-0.40/0.18-0.20 (0.34-0.49/0.185-0.245), femur 0.545-0.625/0.195-0.205 (0.54-0.74/0.19-0.25), tibia 0.44-0.49/0.185-0.205 (0.435-0.60/0.20-0.26), chela (with pedicel) 0.835-0.935/0.22-0.24 (0.86-1.14/0.23-0.31), chela (without pedicel) 0.79-0.885 (0.82-1.075), moveable finger length 0.40-0.43 (0.39-0.515); chelicera 0.16-0.17/0.085-0.095 (0.16-0.20/0.09-0.115), moveable finger length 0.11-0.13 (0.115-0.14); carapace 0.75-0.83/0.50-0.60 (0.795-1.02/0.56-0.72); leg I: coxa 0.215-0.24/0.23-0.27 (0.23-0.29/0.265-0.34), trochanter 0.11-0.125/0.09-0.095 (0.13-0.16/0.09-0.115), femur I 0.10-0.14/0.105-0.12 (0.105-0.15/0.115-0.15), femur II 0.16-0.195/0.105-0.12 (0.165-0.24/0.115-0.15), tibia 0.19-0.215/0.07-0.075 (0.18-0.265/0.075-0.095), tarsus 0.115-0.14/0.05-0.055 (0.115-0.17/0.05-0.065); leg IV: coxa width 0.225-0.28 (0.27-0.29), trochanter 0.16-0.185/0.11-0.125 (0.165-0.21/0.125-0.15), femur I 0.195-0.23/0.17-0.19 (0.205-0.28/0.18-0.22), femur II 0.23-0.28/0.175-0.195 (0.23-0.32/0.18-0.225), tibia 0.34-0.365/0.10-0.11 (0.33-0.45/0.105-0.155), tarsus 0.17-0.19/0.07-0.075 (0.13-0.235/0.07-0.105).

Habitat.—Specimens have been taken from under the bark of several species of trees, including mesquite (*Prosopis* sp.), palo tinto (the scientific name of this tree could not be located) and *Sideroxylon* sp. (Chamberlin 1923).

Remarks.—As discussed above, this species may eventually prove to be identical with *G. depressus*. The male genitalia of these species show no constant differences. The only real differences appear to be the disjunct distributions (Map 1) and the slightly smaller size of *G. sini* (Fig. 39). More specimens must be collected and examined before any definitive statement may be made about the status of *G. sini*.

Other specimens examined.—MEXICO: BAJA CALIFORNIA: Los Angeles Bay, 5-6 May 1921 (J. C. Chamberlin), 4 females (JCC, JC-119.03001-4) (slides): Gulf of California; San Gabriel Bay, Espiritu Santo Island, 1 June 1921 (J. C. Chamberlin), 1 female (JCC, JC-361.03001) (slide): SONORA; San Carlos Bay, under bark of palo tinto, 8 July 1921 (J. C. Chamberlin), 1 female (JCC, JC-687.02001) (slide).

Garyops centralis Beier
Figs. 22-24, 36, 39; Map 1

Garyops centralis Beier 1953:15-16, Figs. 1-2.

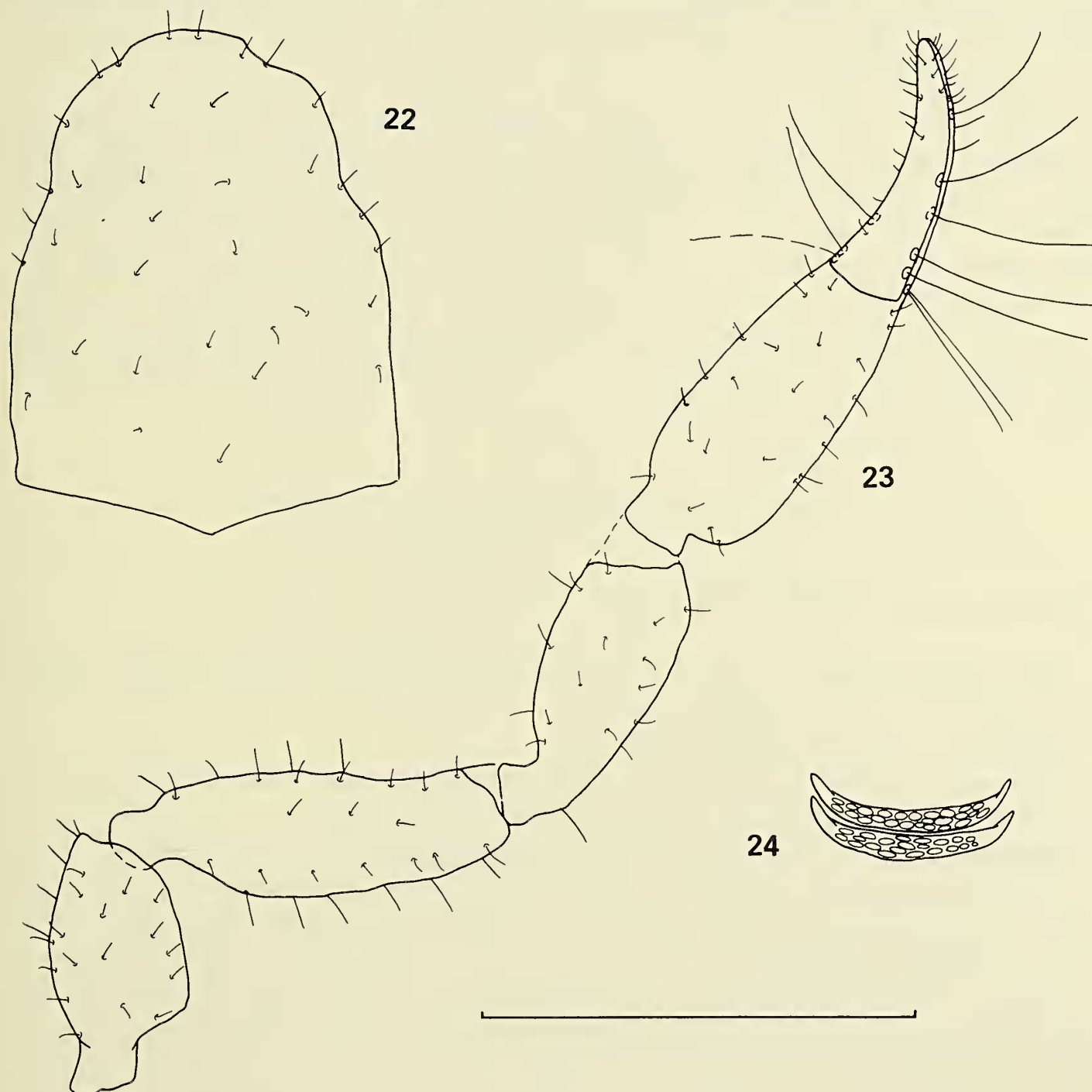
Types.—Paratype female, La Union, Cutuco, El Salvador, 19 April 1951 (A. Zilch), SM, 7682, (spirit). Paratype female, same data as above, NHMW (spirit).

Distribution.—El Salvador (Map 1).

Diagnosis.—Female galea with five distal rami and one subbasal ramus. Chela (with pedicel) 1.31 to 1.43 mm (female) in length, 4.09 to 4.15 (female) times longer than broad.

Description.—Female only. Pedipalpal trochanter large and inflated, 1.97 to 2.03, femur 2.95 to 3.25, tibia 2.52 to 2.70, chela (with pedicel) 4.09 to 4.15, chela (without pedicel) 3.86 to 3.95 times longer than broad. Trichobothria as for genus, in usual position (Fig. 23). Serrula exterior of chelicera with 13 lamellae. Galea with five distal and one subbasal rami (Fig. 36). Carapace anteriorly constricted (Fig. 22), with 34 to 35 setae; 1.30 to 1.33 times longer than broad. Genitalia as for genus (Fig. 24). Tergal chaetotaxy: 6-7:6:4:6-7:6-7:6-8:7-8:7-8:6:T1T4T1T?:2. Sternal chaetotaxy: 0:9:(0)4-5(0):(1)5-6(1):7:6-7:7:8:6:T1T4T1T?:2. Coxal chaetotaxy: 4-5:4-5:4-5:5-6.

Dimensions (mm): Body length 3.6; pedipalps: trochanter 0.59-0.635/0.195-0.32, femur 0.90-0.96/0.28-0.325, tibia 0.72-0.78/0.27-0.31, chela (with pedicel) 1.31-1.43/



Figs. 22-24.—*Garyops centralis* Beier, female paratype: 22, dorsal aspect of carapace; 23, ventral aspect of left pedipalp; 24, median cribriform plates. Scale line = 1.00 mm (Figs. 22-23), 0.25 mm (Fig. 24).

0.32-0.35, chela (without pedicel) 1.265-1.35, moveable finger length 0.61-0.65; chelicera 0.22-0.255/0.12-0.135, moveable finger length 0.05-0.065; carapace 1.16-1.21/0.87-0.93; leg I: coxa 0.32-0.36/0.40-0.43, trochanter 0.185-0.21/0.21-0.13, femur I 0.19-0.22/0.145-0.155, femur II 0.28-0.295/0.15-0.16, tibia 0.28-0.31/0.10, tarsus 0.14-0.165/0.07; leg IV: coxa width 0.39-0.44, trochanter 0.23-0.26/0.155-0.17, femur I 0.33-0.375/0.22-0.265, femur II 0.445-0.48/0.23-0.275, tibia 0.51-0.56/0.14-0.155, tarsus 0.26-0.27/0.105-0.11.

Habitat.—No habitat data accompanied the specimens.

Remarks.—Beier (1953) erroneously referred to the NHMW specimen as a male, and labelled it as such. Furthermore, he stated that the holotype male and a paratype female were deposited in SM; the former specimen is apparently not housed in this institution (Dr. Grasshoff, pers. comm.), but a lectotype female has not been designated in the hope that the male might eventually reappear.

Garyops centralis may be a junior synonym of *G. (?) ferrisi*, but the paucity of specimens precludes any definite statements. They are virtually identical in size (Fig. 39), but since males of *centralis* and females of *ferrisi* are not yet known, the final decision must await further collecting.

Females of *G. centralis* possess spurred median cribriform plates which justifies its inclusion in this genus. These plates (Fig. 24) appear to be different to those of the other species of the genus, but this is simply due to the mode of preservation of the specimens. Females of *G. depressus* and *G. sini* were eviscerated and mounted on microscope slides; this tends to push the cribriform plates so that they lie flat. Females of *G. centralis* were not eviscerated (due to curatorial preferences) and the cribriform plates were lying in a slightly different plane. Several non-eviscerated specimens of *G. depressus* and *G. sini* were examined, and their plates also lay at a different angle, as shown by Chamberlin (1931: Fig. 52o) for the latter species.

Garyops (?) ferrisi (Chamberlin), new combination

Figs. 25-27, 30, 39; Map 1

Sternophorus ferrisi Chamberlin 1932a:143; Beier 1932:18.

Type.—Holotype male, no exact locality, Michoacan, Mexico, under bark of tree, date? (G. F. Ferris), JCC, JC-275.01001 (slide).

Distribution.—Michoacan, Mexico (Map 1).

Diagnosis.—Male genitalia with long dorsal apodemes. Chela (with pedicel) 1.425 to 1.45 mm (male) in length, 4.25 (male) times longer than broad.

Description.—Male only. Pedipalpal trochanter large and inflated, 2.05 to 2.08, femur 3.33 to 3.36, tibia 2.76 to 2.86, chela (with pedicel) 4.25, chela (without pedicel) 4.01 times longer than broad. Trichobothria as for genus, in usual position (Figs. 26-27). Serrula exterior of chelicera with 12 to 13 lamellae. Galea simple. Carapace anteriorly constricted (Fig. 25), with 23 setae; 1.27 times longer than broad. Male genitalia (Fig. 30) with long dorsal apodemes, and apparently with a large, median foramen. Tergal chaetotaxy: 6:6:4:5:6:6:6:5:?:T1T4T1T:?:2. Sternal chaetotaxy: 0:7:(0)3[3](0):(1)6(1):8:8:6:6:6:T1T4T1T:?:2. Coxal chaetotaxy: 4-5:5-6:4-5:5.

Dimensions (mm): Body length 3.8; pedipalps: trochanter 0.665-0.675/0.325, femur 0.99-1.00/0.295-0.30, tibia 0.80/0.28-0.29, chela (with pedicel) 1.425-1.45/0.335, chela (without pedicel) 1.34-1.345, moveable finger length 0.59-0.62; chelicera 0.27/0.16-

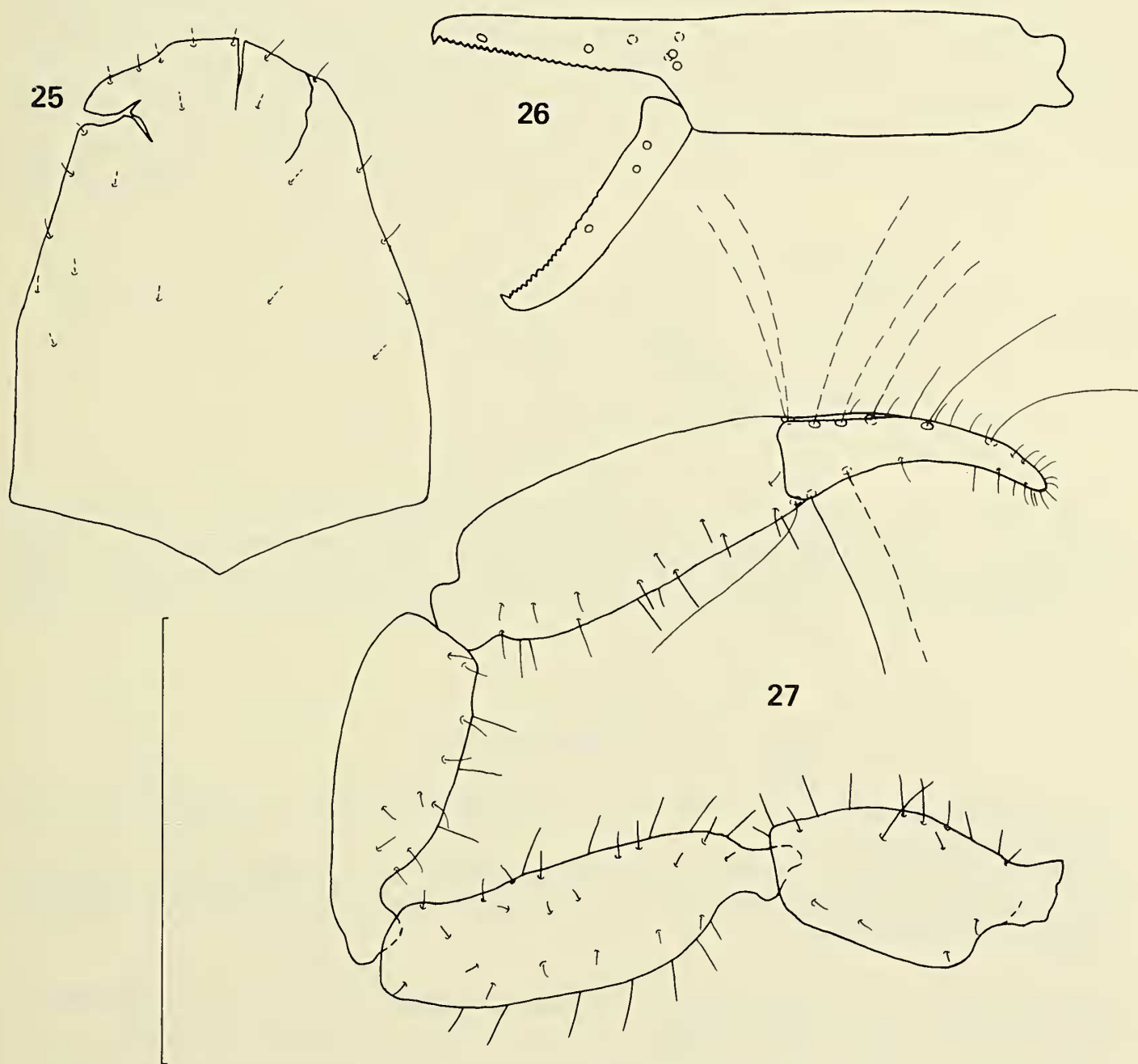
0.165, moveable finger length 0.17-0.175; carapace 1.205/0.95; leg I: coxa 0.32-0.33/0.40-0.41, trochanter 0.18-0.19/0.125-0.145, femur I 0.165-0.17/0.185-0.195, femur II 0.28/0.185-0.195, tibia 0.315-0.32/0.10-0.105, tarsus 0.20/0.07-0.075; leg IV: coxa width 0.37-0.38, trochanter 0.235-0.24/0.165-0.17, femur I 0.31/0.265-0.27, femur II 0.42-0.43/0.28, tibia 0.54/0.15, tarsus 0.275-0.28/0.105.

Habitat.—No habitat data accompanied the specimen, yet Chamberlin (1932a) noted that it was “collected under bark of a tree”.

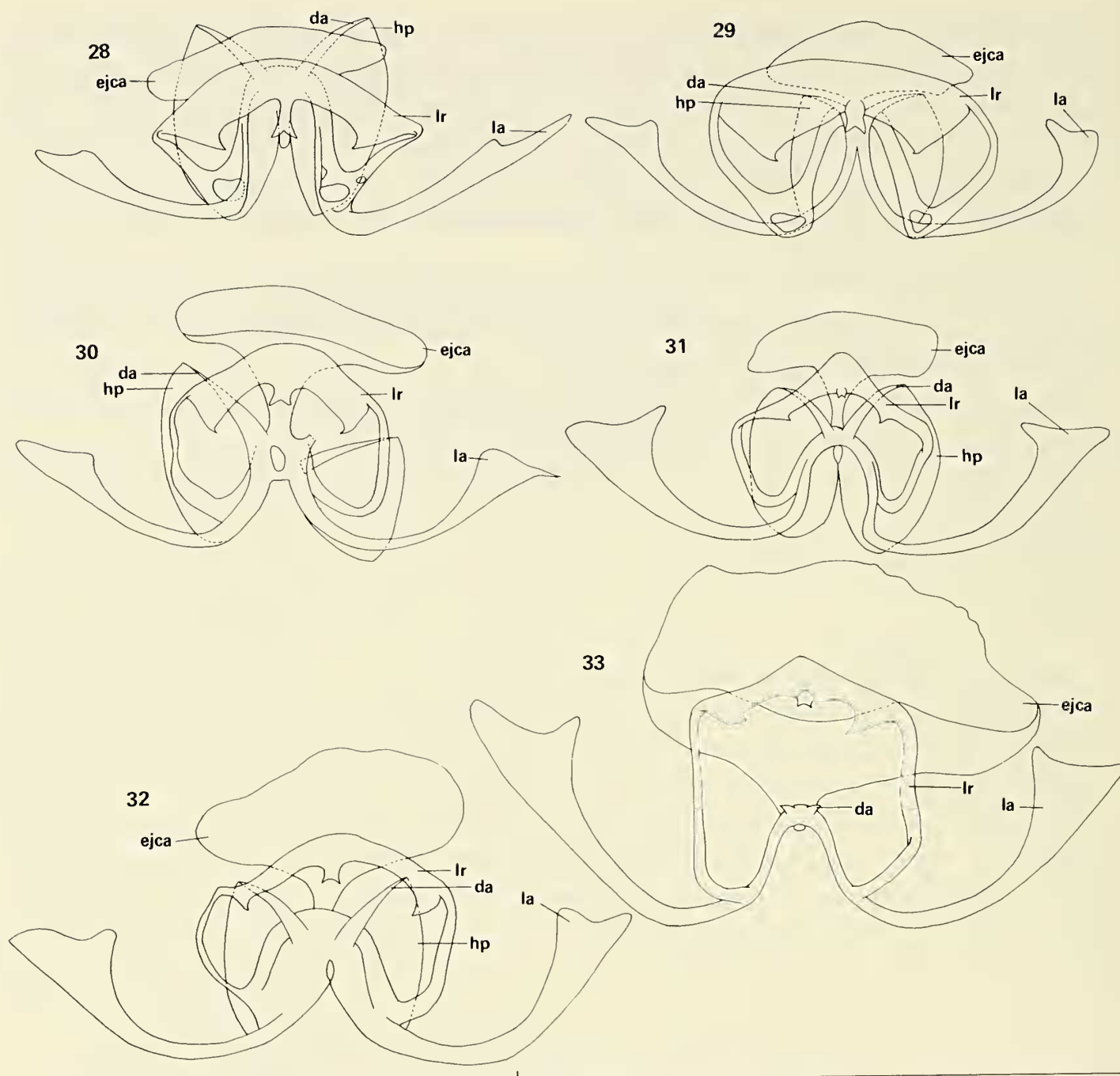
Remarks.—Since females of this species are unknown, the generic position of *ferrisi* is uncertain. It is tentatively placed in *Garyops* because of its similarity with *G. centralis*, with which it may be conspecific (see above).

The apparent lack of setae on one side of the pedipalpal tibia and chela (Fig. 27) is an artifact which probably occurred during preparation of the slide.

The exact collection site of the holotype is unknown, and Map 1 shows the state record only.



Figs. 25-27.—*Garyops* (?) *ferrisi* (Chamberlin), male holotype: 25, dorsal aspect of carapace; 26, lateral aspect of left chela; 27, ventral aspect of right pedipalp. Scale line = 1.00 mm.



Figs. 28-33.—Anterior portion of male genitalia, ventral aspect: 28, *Garyops depressus* Banks, S-2782.2; 29, *G. sini* (Chamberlin), paratype, JC-176.04001; 30, *G. (?) ferrisi* (Chamberlin), holotype; 31, *Idiogaryops paludis* (Chamberlin), S-2887.2; 32, *I. pumilus* (Hoff) from Little Cayman Island; 33, *I. sp.*, S-2886.2. Scale line = 0.25 mm (Figs. 28-29), 0.33 mm (Fig. 30), 0.167 mm (Figs. 31-33).

Genus *Idiogaryops* Hoff

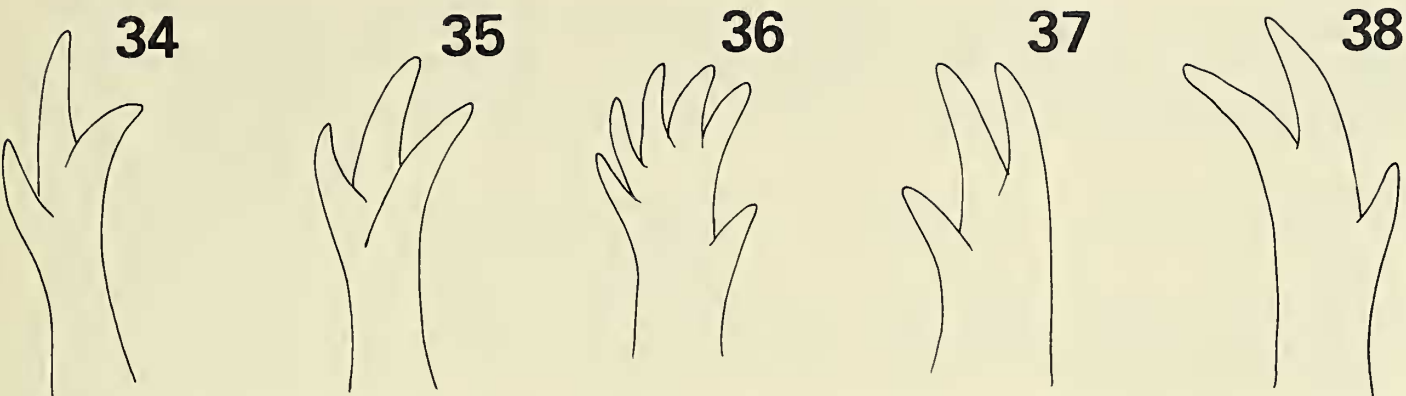
Garyops Banks 1909:305 (in part); Chamberlin 1931:238 (in part); Beier 1932:18 (in part); Hoff 1963: 2-3 (in part).

Sternophorus Chamberlin: Beier 1932:16 (in part); Murthy and Ananthakrishnan 1977:16 (in part). *Idiogaryops* Hoff 1963:10-11. Type species by original designation and monotypy *Sternophorus paludis* Chamberlin 1932a.

Distribution.—Little Cayman Island; Arkansas, Florida, Georgia, Illinois, Mississippi, North Carolina, Texas, U.S.A. (Map 2).

Diagnosis.—Females with two (occasionally three) unspurred, median cribriform plates. Fixed chelal finger with seven trichobothria, moveable chelal finger with two or three trichobothria.

Subordinate taxa.—*Idiogaryops paludis* (Chamberlin), *Idiogaryops pumilus* (Hoff).

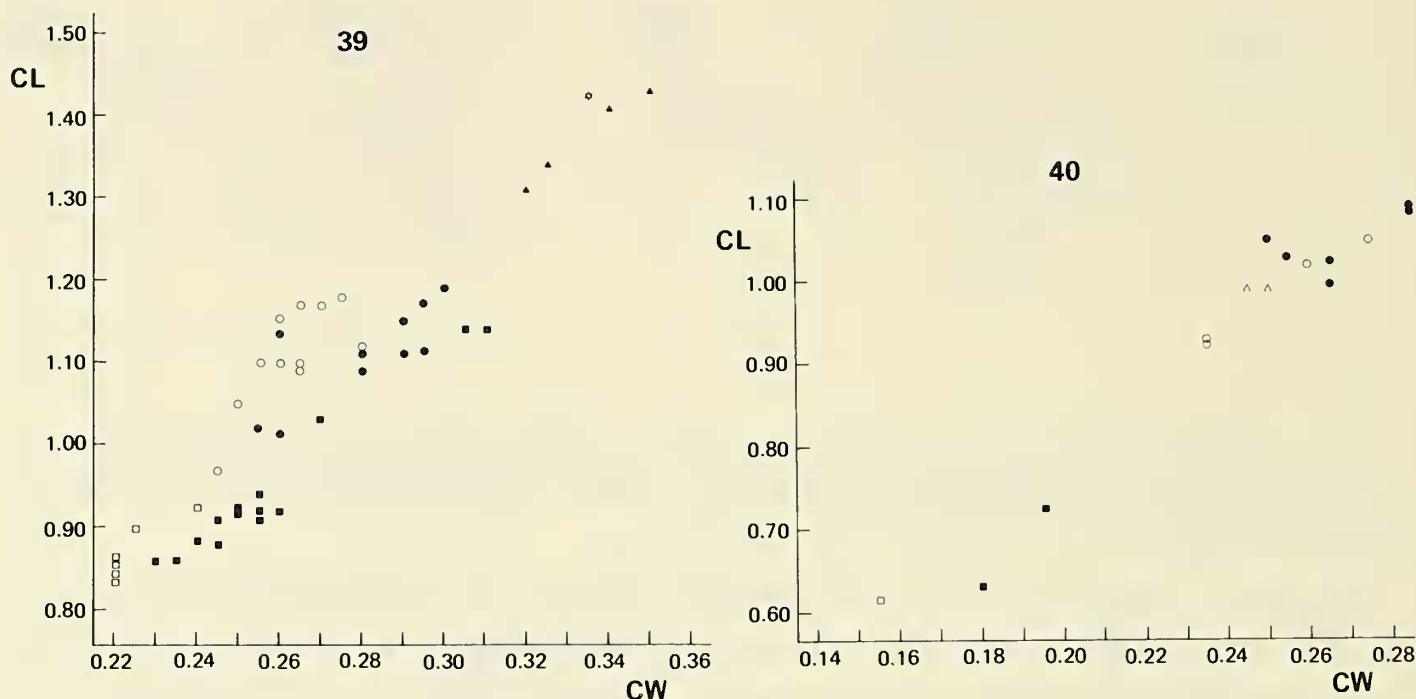


Figs. 34-38.—Female galeae: 34, *G. depressus* Banks, S-2840.1; 35, *G. sini* (Chamberlin), paratype, JC-714.01002; 36, *G. centralis* Beier, paratype; 37, *Idiogaryops paludis* (Chamberlin), S-2826.2; *I. pumilus* (Hoff), paratype, S-3782.3. Not to same scale.

Remarks.—*Idiogaryops* is here redefined to include all sternophorids with two unspurred, median cribriform plates, even though it was originally restricted by Hoff (1963) to include only *I. paludis*, on the basis of it possessing only two trichobothria on the moveable chelal finger. As discussed above, to give generic status to species which lack individual trichobothria has extended the generic system and has obscured obvious relationships between species. Therefore, this genus, as here interpreted, contains species with two or three trichobothria on the moveable chelal finger. Those with two trichobothria are placed in the *paludis* group, and those with three trichobothria are placed in the *pumilus* group.



Map. 2.—North America showing known distribution of *Idiogaryops paludis* (Chamberlin) (circles) and *I. pumilus* (Hoff) (squares). Open symbols represent literature records only.



Figs. 39-40.—Graphs of chela (with pedicel) length (CL) versus width (CW), in mm; open symbols, males; closed symbols, females: 39, *Garyops depressus* Banks (circles), *G. sini* (Chamberlin) (squares), *G. centralis* Beier (triangles), *G. (?) ferrisi* (Chamberlin) (star); 40, *Idiogaryops paludis* (Chamberlin) (squares), *I. pumilus* (Hoff) (circles), *I. sp.* (triangles).

Paludis group

Diagnosis.—As for genus, except that the moveable chelal finger possesses two trichobothria, *b* and *t*.

Subordinate taxa.—*Idiogaryops paludis* (Chamberlin).

Idiogaryops paludis (Chamberlin)

Figs. 31, 37, 40-45; Map 2

Sternophorus paludis Chamberlin 1932a:142-143; Beier 1932:17-18; Hoff and Bolsterli 1956:164-165; Hoff 1958:19.

Idiogaryops paludis (Chamberlin): Hoff 1963:11-13, Figs. 7-9; Weygoldt 1969:27, Fig. 105; Rowland and Reddell 1976:19; Brach 1979:34-38.

Types.—Holotype male, no exact locality, Alachua County, Florida, U.S.A., 30 March 1925 (T. H. Hubbell), depository unknown, JC-725.01001 (slide?), not examined. Paratype female, Billy's Island, Okefinokee Swamp, Georgia, U.S.A., date? (C. R. Crosby), depository unknown, JC-43.02001 (slide?), not examined.

Distribution.—Arkansas, Florida, Georgia, Illinois, Mississippi, North Carolina, Texas, U.S.A. (Map 2).

Diagnosis.—Male genitalia with long dorsal apodemes. Small species: chela (without pedicel) [from Hoff and Bolsterli (1956) and Hoff (1963)] 0.61 to 0.67 (male), 0.61 to 0.715 mm (female) in length.

Description.—Supplementary to Chamberlin (1932a), Hoff and Bolsterli (1956) and Hoff (1963). Carapace (Fig. 44) only slightly constricted anteriorly. Male genitalia (Fig. 31) with long, tapering dorsal apodemes.

Habitat.—Hoff and Bolsterli (1956), Hoff (1963), Weygoldt (1969) and Brach (1979) have recorded this species from a variety of cortical habitats (*Pinus elliotti*, *Ilex cassine*, *Quercus virginianus*, *Platanus occidentalis* and *Carya alba*).

Remarks.—Previous authors have adequately described this species and little needs to be added here except for details of the male genitalia which were omitted in previous papers. Hoff (1963) recorded the occasional presence of a small, third median cribriform plate in some females.

Contrary to Chamberlin (1932a), the type specimens are not deposited at Cornell University (Dr. L. L. Pechuman, pers. comm.).

Specimens examined.—U.S.A.: FLORIDA; *Highlands Co.*, Archbold Biological Station, 14 April 1956 (C. C. Hoff), 1 female (AMNH, S-2826.2) (slide). Same data as above except 22 April 1956, 1 male (AMNH, S-2887.?) (slide). Same data as above except 1 May 1956, 1 female (AMNH, S-2951.3) (slide).

Pumilus group

Diagnosis.—As for genus, except that the moveable chelal finger possesses three trichobothria, *b*, *sb* and *t*.

Subordinate taxa.—*Idiogaryops pumilus* (Hoff).

Idiogaryops pumilus (Hoff), new combination

Figs. 32, 38, 40, 46-50; Map 2

Garyops depressa Banks 1909:305-306 (in part); Hounscome 1980:85 (misidentification).

Garyops pumila Hoff 1963:7-10, Figs. 5-6 (in part).

Types.—Holotype male, Parker Islands, near Lake Placid, Highlands County, Florida, U.S.A., under bark of live oak [*Quercus virginianus*], 22 April 1956 (C. C. Hoff), AMNH, S-2886.8 (slide). Paratype female, Mahogany Hammock, Everglades National Park, Florida, U.S.A., [under bark of *Metopium toxiferum*], 8 February 1958 (F. C. Craighead), AMNH, S-3782.3 (slide). Paratype female, Punta Gorda, Charlotte County, Florida, U.S.A., date? [A. T. Slosson], MCZ, S-3791.3 (slide) (syntype of *G. depressus*). (The type series also consisted of other specimens which were not examined.)

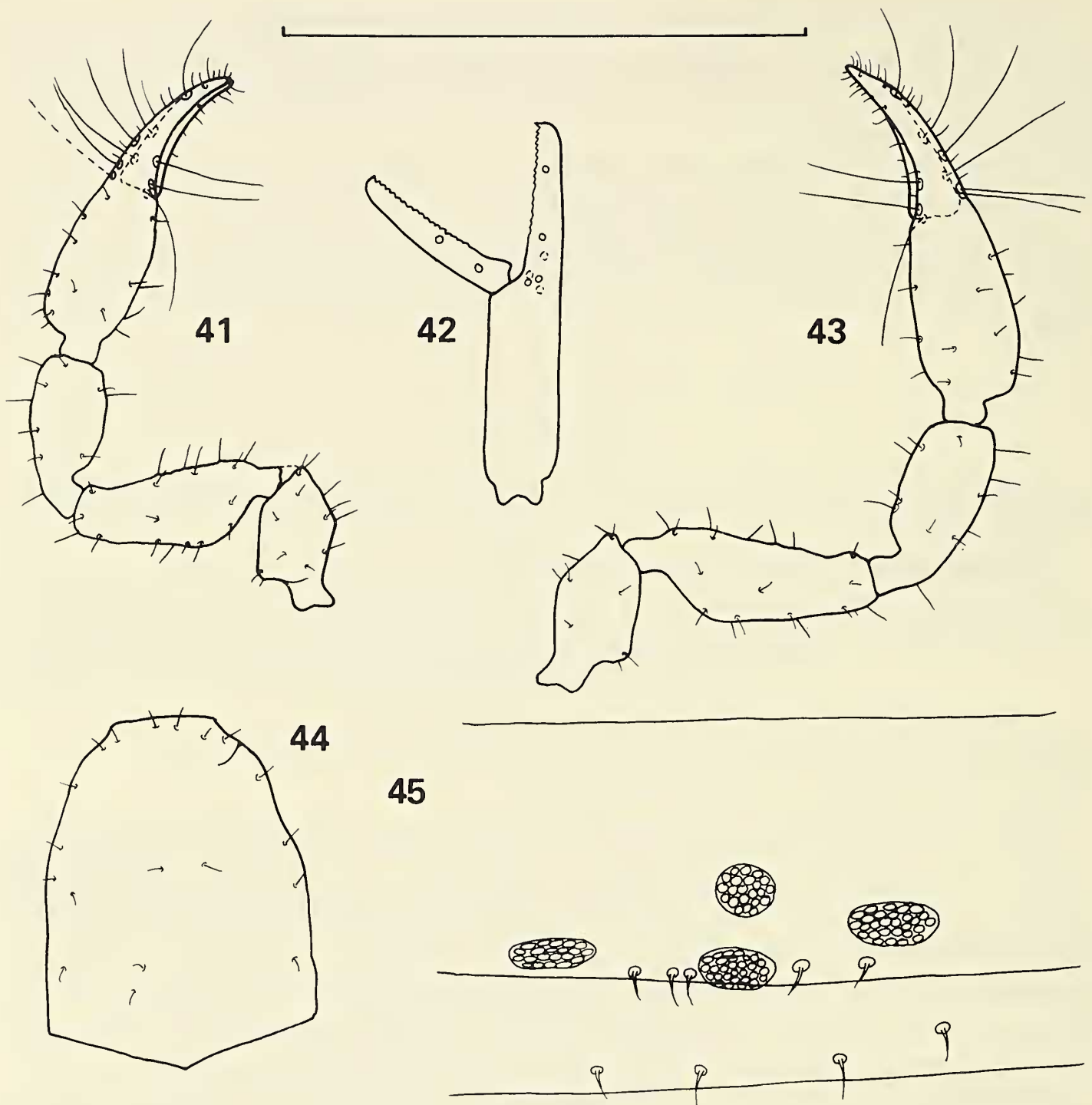
Distribution.—Florida, U.S.A.; Little Cayman Island (Map 2).

Diagnosis.—Male genitalia with long, tapering dorsal apodemes. Chela (without pedicel) [from Hoff (1963)] 0.865 to 0.95 (male), 0.95 to 1.07 mm (female) in length.

Description.—Supplementary to Hoff (1963). Carapace (Fig. 46) 1.31 (male), 1.32 to 1.34 (female) times longer than broad, with 31 (male), 21? to 32 (female) setae. One female specimen (S-3782.3) has *et* missing from one chela (Fig. 49). Male genitalia (Fig. 32) with long, tapering dorsal apodemes.

Habitat.—Hoff (1963) briefly discussed the habitat preferences of this species and stated that it had been collected from the bark of oak (*Quercus virginianus*) and poison-wood (*Metopium toxiferum*) and from moss and rotted wood at the base of cabbage palmetto (*Sabal palmetto*). This is in contrast to the sympatric species *G. depressus*, which in Florida is only known from bark of slash pine (*Pinus elliotti*). *Idiogaryops pumilus* was not recorded in Brach's (1979) rigorous search for pseudoscorpions under slash pine bark, and highlights this interesting case of habitat partitioning. The specimens from Little Cayman were apparently taken from "marl facies with tall scrub" (Hounscome 1980).

Remarks.—Hoff described this Floridian species from four males and five females which included one of Banks' syntypes of *G. depressus*. His description is quite thorough and all that needs to be added here are details of the male genitalia and carapaceal ratios.



Figs. 41-45.—*Idiogaryops paludis* (Chamberlin): 41, dorsal aspect of left pedipalp, male, S-2887.2; 42, lateral aspect of left chela, female, S-2826.2; 43, dorsal aspect of right pedipalp, female, S-2826.2; 44, dorsal aspect of carapace, female, S-2826.2; 45, female genitalia and associated sternites, S-2828.2. Scale line = 1.00 mm (Figs. 41-44), 0.25 mm (Fig. 45).

As discussed below under *Idiogaryops* sp., one of the male paratypes of *G. pumilus* is not conspecific with the holotype of this species.

Other specimens examined.—U.S.A.: FLORIDA; Punta Gorda, date? [A. T. Slosson], 1 male, 1 female (MCZ) (spirit) (syntypes of *G. depressus*). LITTLE CAYMAN ISLAND: 3 August 1975 (M. V. Hounsome), 1 male, 1 female (NHMW) (spirit).

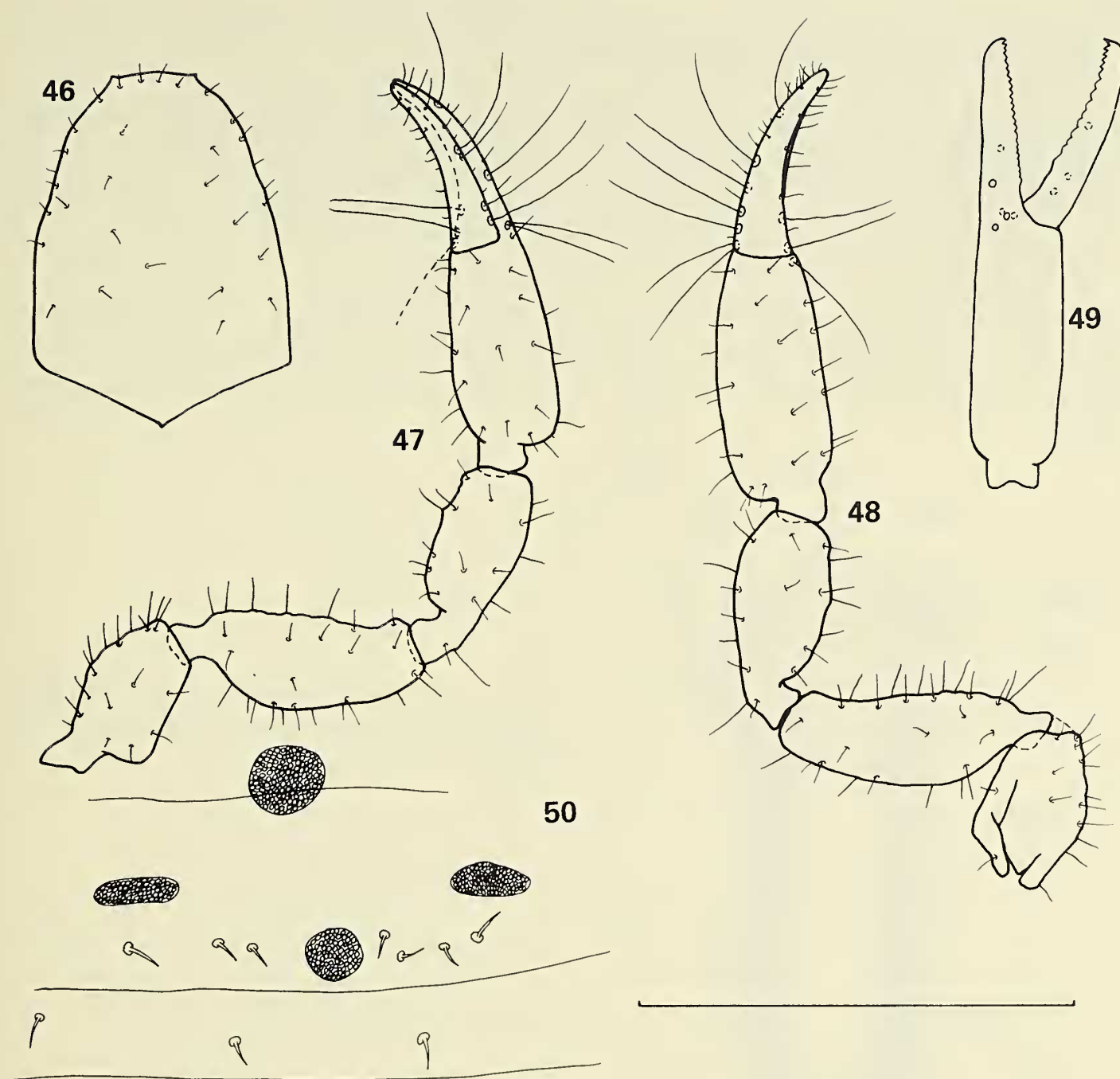
Idiogaryops sp.

Figs. 33, 40

Garyops pumila Hoff 1963:5-6 (in part).

Diagnosis.—Male genitalia with reduced dorsal apodemes.

Remarks.—Even though this specimen possesses pedipalpal morphometrics that are indistinguishable from *I. pumilus* (Fig. 40), the form of the male genitalia (Fig. 33) is



Figs. 46-50.—*Idiogaryops pumilus* (Hoff): 46, dorsal aspect of carapace, male from Little Cayman Island; 47, ventral aspect of left pedipalp, male from Little Cayman Island; 48, ventral aspect of right pedipalp, female from Little Cayman Island; 49, lateral aspect of right chela, female paratype, S-3782.3 (note absence of trichobothrium *et*); 50, female genitalia and associated sternites, from Little Cayman Island. Scale line = 1.00 mm (Figs. 46-49), 0.25 mm (Fig. 50).

substantially different from that species, and it undoubtedly represents a new species. I have not formally described it because I believe that more specimens, including females, should be examined. Indeed, it is possible that one or more of the female paratypes recorded by Hoff (1963) as *G. pumila* may be the female of this species.

Specimens examined.—U.S.A.: FLORIDA; *Highlands Co.*, Parker Islands, near Lake Placid, under bark of live oak [*Quercus virginianus*], 22 April 1956 (C. C. Hoff), 1 male (AMNH, S-2886.2) (slide) (paratype of *G. pumila*).

Genus *Afrosterophorus* Beier, new status

Sternophorus Chamberlin: Beier 1932:16 (in part); Murthy and Ananthakrishnan 1977:118 (in part). *Sternophorus* (*Afrosterophorus*) Beier 1967:81-82. Type species by original designation and monotypy *Sternophorus* (*Afrosterophorus*) *aethiopicus* Beier 1967.

Sternophorellus Beier 1971:371-372. Type species by original designation and monotypy *Sternophorellus araucariae* Beier 1971. NEW SYNONYMY.

Indogaryops Sivaraman 1981:322. Type species by original designation and monotypy *Indogaryops amrithiensis* Sivaraman 1981. NEW SYNONYMY.

Distribution.—New South Wales, Northern Territory, Queensland, Victoria, Australia; Ethiopia; India; Kampuchea; Laos; Papua New Guinea; Sri Lanka; Vietnam (Maps 3 to 6).

Diagnosis.—Females with one unspurred, median cribriform plate. Fixed chelal finger with seven trichobothria, moveable chelal finger with two or three trichobothria.

Subordinate taxa.—*Afrosterophorus aethiopicus* (Beier), *A. anabates*, new species, *A. araucariae* (Beier), *A. cavernae* (Beier), *A. ceylonicus* (Beier), *A. chamberlini* (Redikorzev), *A. cylindrimanus* (Beier), *A. dawydoffi* (Beier), *A. fallax*, new species, *A. grayi* (Beier), *A. hirsti* (Chamberlin), *A. nanus*, new species, *A. papuanus* (Beier), *A. xalyx*, new species.

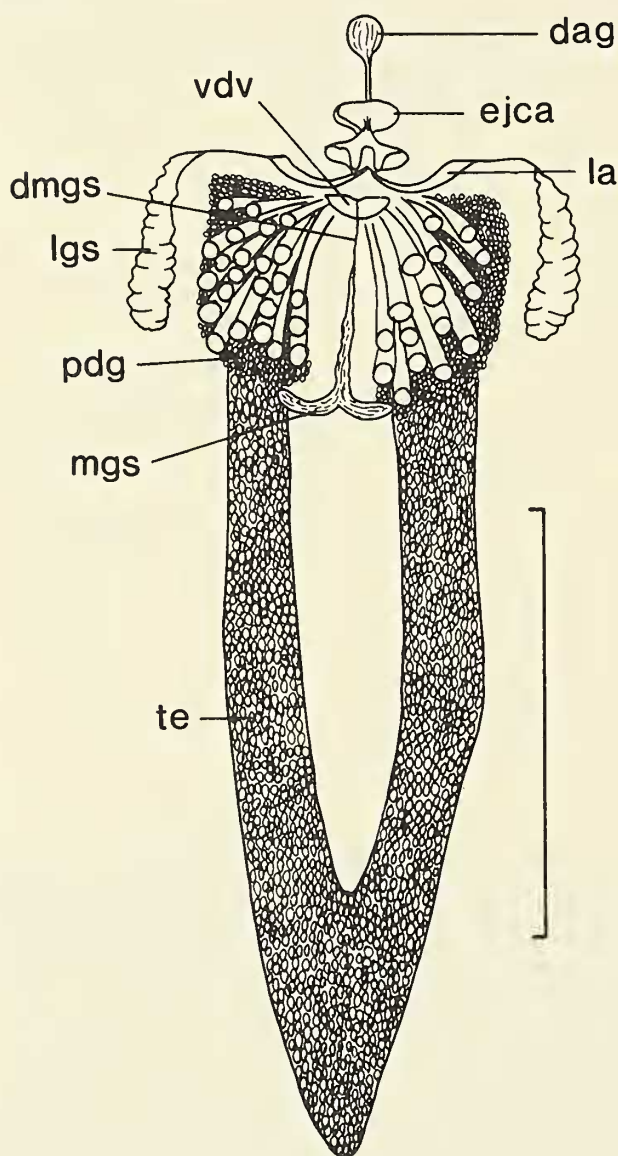
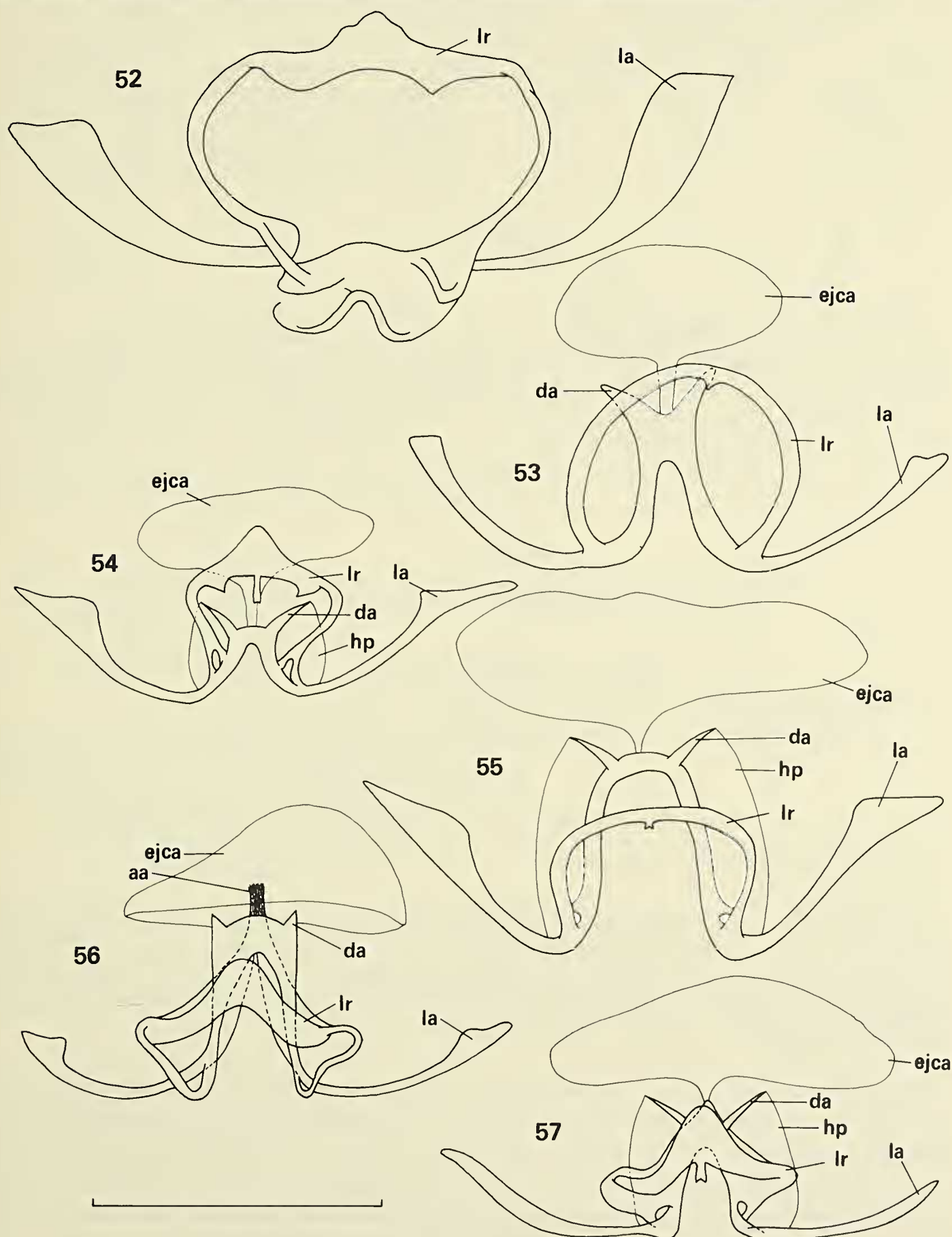


Fig. 51.—Ventral aspect of male genitalia of *Afrosterophorus hirsti* (Chamberlin), MH302.41. Scale line = 0.30 mm.

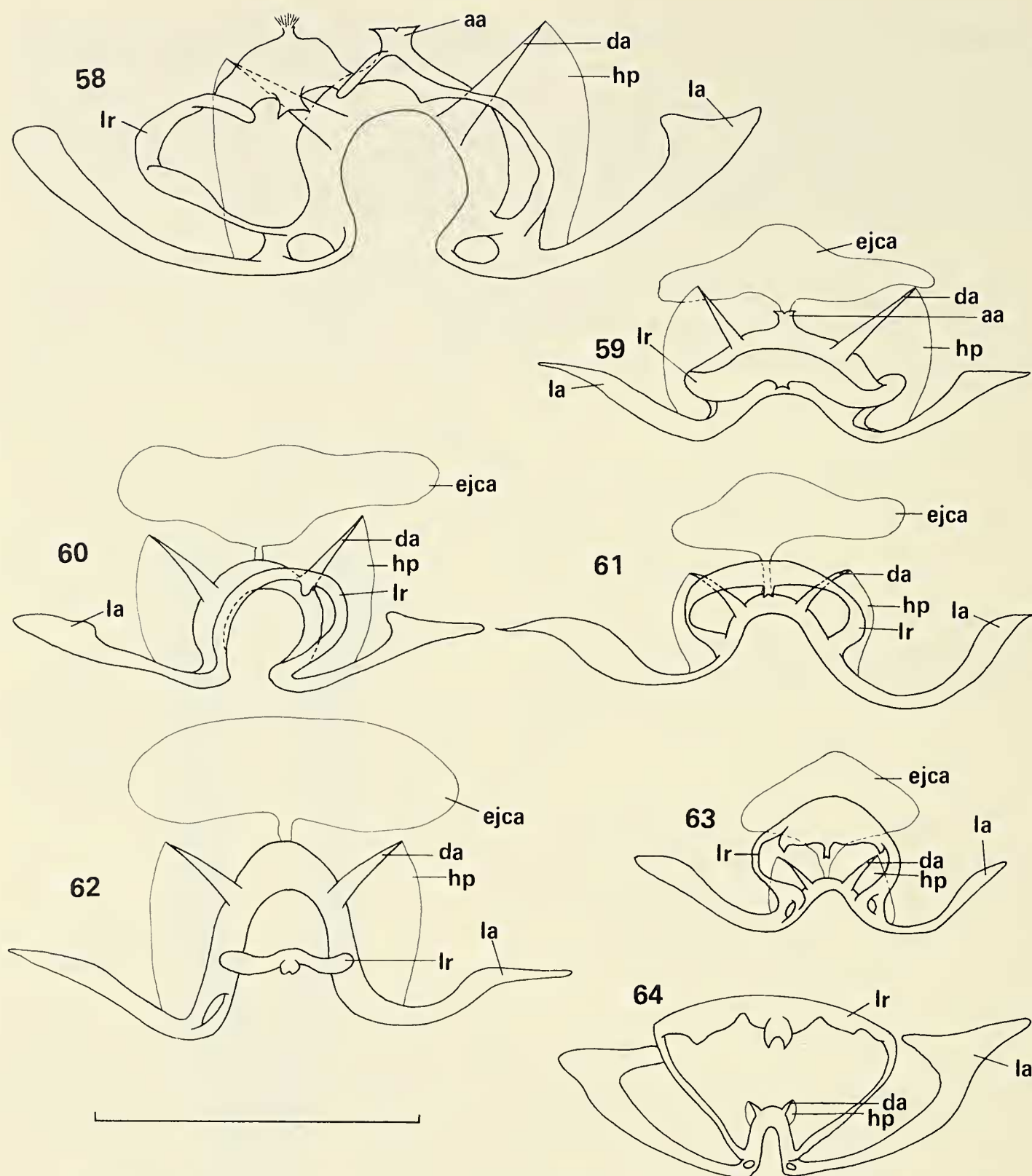
Remarks.—Beier (1967) originally described *Afrosterophorus* as a subgenus of the genus *Sternophorus*; the latter has been shown above to be a junior synonym of *Garyops*. Therefore, it is necessary to reassess the status of *Afrosterophorus*. Since females are needed to unequivocally place species in genera, it is unfortunate that *S. aethiopicus* (the type species of *Afrosterophorus*) is currently represented in collections by a single male. Nevertheless, I have raised *Afrosterophorus* to full generic status to accommodate those sternophorids in which females possess genitalia with one unspurred, median cribriform plate. If in the future it can be shown that *A. aethiopicus* is not congeneric with the remaining species I have included in the genus, *Sternophorellus* is the next available name.

Sternophorellus was erected by Beier (1971) for *S. araucariae* Beier from Papua New Guinea. It differed from other genera (except *Idiogaryops*) by possessing only two

trichobothria on the moveable chelal finger. This is no longer considered to be a valid character for separating genera, and we are left with the female genitalia to delimit the higher taxa. Unfortunately, females of *S. araucariae* have not been available for study, but females of the new species *A. fallax* from Vietnam and *A. xalyx* from Australia, which also have only two such trichobothria, possess genitalia with only one median cribriform plate. Therefore, *Sternophorellus* is synonymized with *Afrosterphorus*.

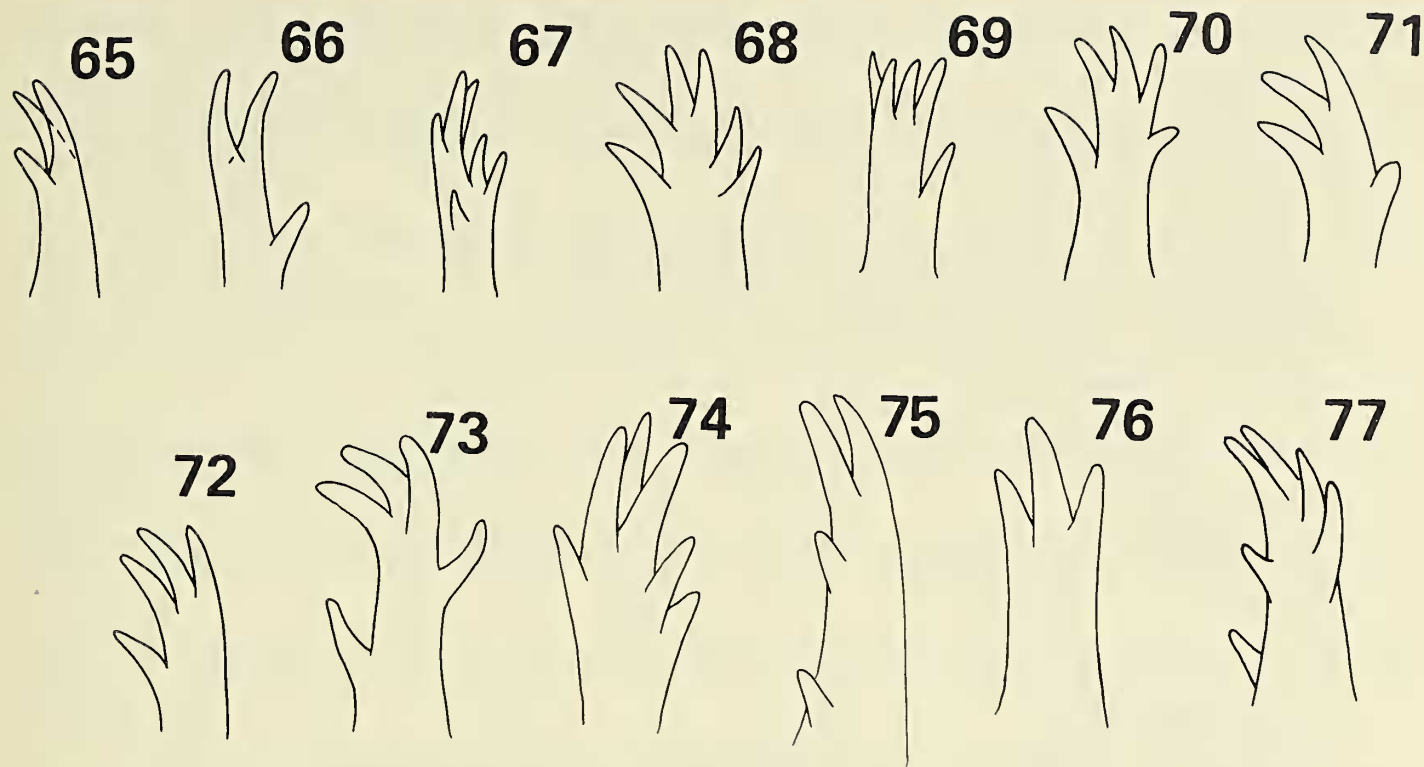


Figs. 52-57.—Anterior portion of male genitalia, ventral aspect: 52, *Afrosterphorus aethiopicus* (Beier), holotype (ejca not shown); 53, *A. ceylonicus* (Beier), paralectotype from Per Aru, Sri Lanka; 54, *A. chamberlini* (Redikorzev); 55, *A. dawydoffi* (Beier), paralectotype, MH430.01; 56, *A. hirsti* (Chamberlin), MH302.21; 57, *A. nanus*, new species, holotype. Scale line = 0.10 mm.



Figs. 58-64.—Anterior portion of male genitalia, ventral aspect: 58, *Afrosternophorus anabates*, new species, paratype, MH044.01 (*ejca* not shown); 59, *A. papuanus* (Beier), lectotype; 60, *A. grayi* (Beier), lectotype (slightly distorted); 61, *A. araucariae* (Beier), holotype; 62, *A. cavernae* (Beier), paratype; 63, *A. fallax*, new species, holotype; 64, *A. xalyx*, new species, holotype (*ejca* not shown). Scale line = 0.10 mm.

Indogaryops was erected by Sivaraman (1981) to include the Indian species *I. amrithiensis*. It was segregated from other genera by the presence of both a cucullus and an anterior constriction of the carapace. As discussed above, all sternophorid genera possess a cucullus, and the degree of constriction in the carapace may vary intraspecifically (see *A. dawydoffi*, Figs. 95-97); therefore, both characters are invalid at the generic level. More importantly, females of *I. amrithiensis* possess one median cribriform plate, and therefore *Indogaryops* falls into synonymy with *Afrosternophorus*. Furthermore, *I. amrithiensis* is a junior synonym of *A. ceylonicus*.



Figs. 65-77.—Female galeae: 65-66, *Afrosternophorus ceylonicus* (Beier), paralectotype from Chemiyanpattu, Sri Lanka; 67, *A. chamberlini* (Redikorzev); 68, *A. dawydoffi* (Beier), paralectotype from Roessei Chrum, Kampuchea; 69, *A. cylindrinanus* (Beier), paralectotype; 70, *A. hirsti* (Chamberlin), MH302.48; 71, *A. hirsti*, MH302.50; 72, *A. nanus*, new species, paratype, MH230.09; 73, *A. anabates*, new species, paratype, MH416.10; 74, *A. papuanus* (Beier), paralectotype; 75, *A. grayi* (Beier), paralectotype from Bulolo, Papua New Guinea; 76, *A. fallax*, new species, paratype; 77, *A. xalyx*, new species, paratype, K160. Not to same scale.

KEY TO SPECIES OF *AFROSTERNOPHORUS*

- 1. Moveable chelal finger with three trichobothria, *b*, *sb* and *t* *aethiopicus* group. . . 2
Moveable chelal finger with two trichobothria, *b* and *t* *araucariae* group. . . 11
- 2. Male genitalia with reduced dorsal apodemes 3
Male genitalia with long, tapering dorsal apodemes. 5
- 3. Male genitalia with brush-like anterior apodeme; dorsal apodemes parallel sided; Australia *hirsti* (Chamberlin)
Male genitalia without brush-like anterior apodeme; dorsal apodemes, if visible, not parallel sided 4
- 4. Chelal fingers long and strongly curved; male genitalia with short, but prominent, dorsal apodemes, slightly curved; female galea with two distal and one subdistal to subbasal rami; India, Sri Lanka. *ceylonicus* (Beier)
Chelal fingers not especially long or strongly curved; male genitalia with much reduced dorsal apodemes, not visible; female galea unknown; Ethiopia *aethiopicus* (Beier)
- 5. Male genitalia with anterior apodeme distally broad; female galea with three distal, one subdistal and two (sometimes one) subbasal rami. 6
Male genitalia with anterior apodeme not distally broad; female galea not as above 7

6. Chela (with pedicel) 0.83 to 0.895 (male), 0.835 to 1.03 mm (female) in length; Australia *anabates*, new species
Chela (with pedicel) 0.61 to 0.69 (male), 0.73 to 0.74 mm (female) in length; Papua New Guinea. *papuanus* (Beier)
7. Lateral rod of male genitalia with long mid-piece; female galea with two distal, one subdistal and three subbasal rami; Vietnam, Laos (?) . . . *chamberlini* (Redikorzev)
Lateral rod of male genitalia without, or with short, mid-piece; female galea never with three subbasal rami. 8
8. Chela (with pedicel) less than 0.74 mm in length; female galea with three distal to subdistal rami. 9
Chela (with pedicel) greater than 0.90 mm in length; female galea with at least four distal to subdistal rami. 10
9. Chela (with pedicel) 0.645 to 0.70 (male), 0.68 to 0.74 mm (female) in length; Papua New Guinea. *grayi* (Beier)
Chela (with pedicel) 0.55 to 0.59 (male), 0.56 to 0.61 mm (female) in length; Australia. *nanus*, new species
10. Chela (with pedicel) 1.07 to 1.35 (male), 1.11 to 1.38 mm (female) in length; female galea with six (sometimes five) distal to subdistal rami; Kampuchea, Vietnam *dawydoffi* (Beier)
Chela (with pedicel) 0.935 to 0.95 (male), 1.02 mm (female) in length; female galea with four distal and one subbasal rami; Laos. *cylindrimanus* (Beier)
11. Male genitalia with reduced dorsal apodemes; female galea with two distal and four subdistal to subbasal rami; Australia *xalyx*, new species
Male genitalia with long dorsal apodemes; female galea (when known) not as above 12
12. Chela (with pedicel) 0.805 to 0.82 mm (male) in length, 4.47 to 4.56 (male) times longer than broad; Papua New Guinea *araucariae* (Beier)
Chela (with pedicel) less than 0.70 mm in length, less than 4.00 times longer than broad 13
13. Lateral rod of male genitalia with short mid-piece; Papua New Guinea.
. *cavernae* (Beier)
Lateral rod of male genitalia with long mid-piece; Vietnam . . . *fallax*, new species

Aethiopicus group

Diagnosis.—As for genus, except that the moveable chelal finger possesses three trichobothria, *b*, *sb* and *t*.

Subordinate taxa.—*Afrosterphorus aethiopicus* (Beier), *A. anabates*, new species, *A. ceylonicus* (Beier), *A. chamberlini* (Redikorzev), *A. cylindrimanus* (Beier), *A. dawydoffi* (Beier), *A. grayi* (Beier), *A. hirsti* (Chamberlin), *A. nanus*, new species, *A. papuanus* (Beier).



Map 3.—North Africa showing known distribution of *Afrosternophorus aethiopicus* (Beier).

Afrosternophorus aethiopicus (Beier), new combination

Figs. 52, 78-79; Map 3

Sternophorus (*Afrosternophorus*) *aethiopicus* Beier 1967:81-82, Fig. 6.

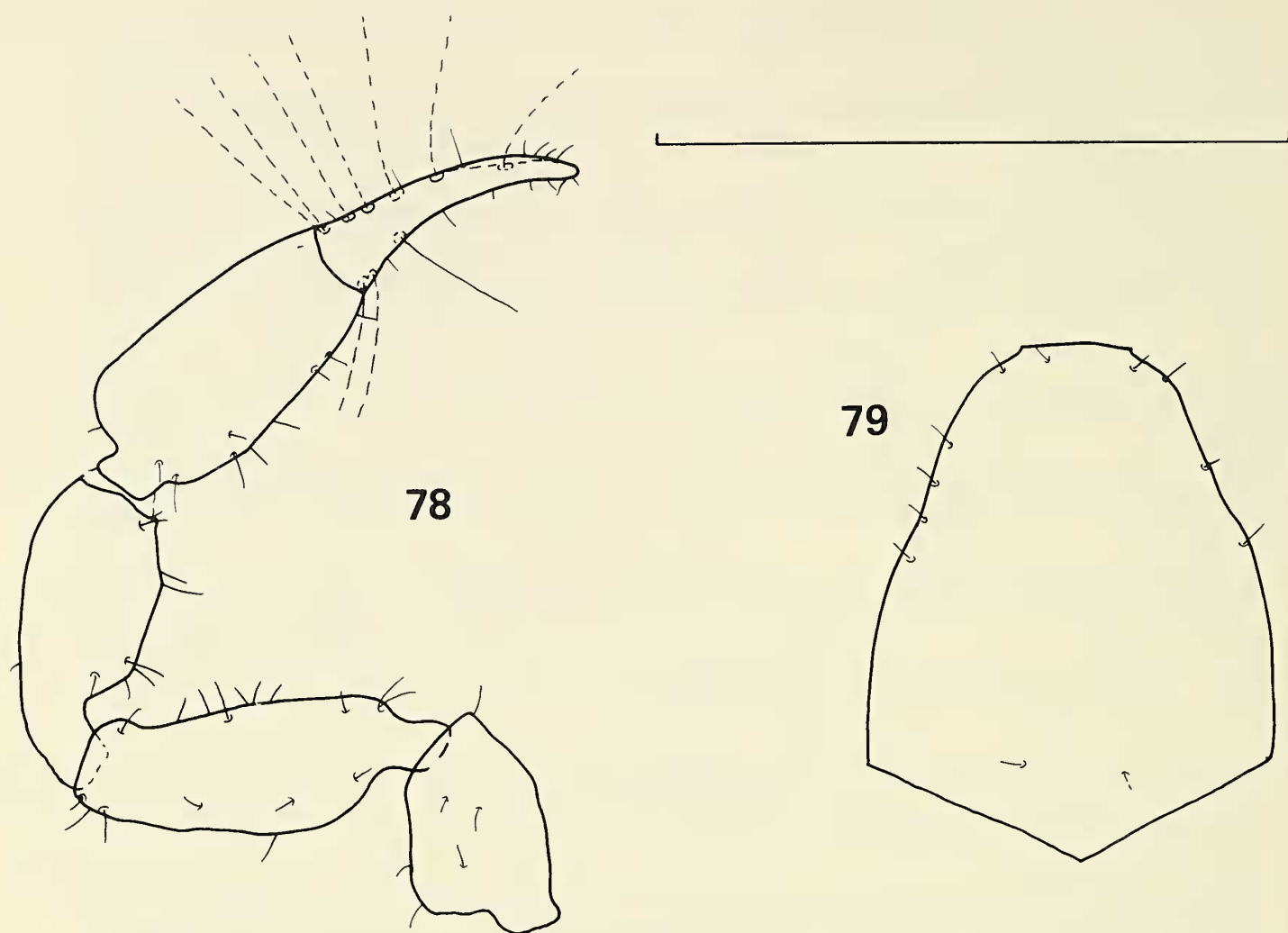
Type.—Holotype male, Alomata, Ethiopia (5000 ft) [= 1525 m], 16 January 1960 (E. S. Ross), CAS, Type No. 9386 (slide).

Distribution.—Ethiopia (Map 3).

Diagnosis.—Male genitalia with greatly reduced dorsal apodemes; lateral rod lying anteriorly to the rest of the genital armature. Chela (with pedicel) 0.895 mm (male) in length.

Description.—Male only. Pedipalpal trochanter large and inflated, 1.76, femur 2.68 to 2.76, tibia 1.90, chela (with pedicel) 3.52, chela (without pedicel) 3.49 times longer than broad. Trichobothria as for *aethiopicus* group, in usual position (Fig. 78). Serrula exterior of chelicera with 12 lamellae. Galea of male simple. Carapace anteriorly constricted (Fig. 79), with at least 12 setae; 1.37 times longer than broad. Male genitalia (Fig. 52) with greatly reduced dorsal apodemes; lateral rod lying anteriorly to the rest of the genital armature. Tergal chaetotaxy: 6:7:5:5:5:6:6:6:6:T1T4T1T?:2. Sternal chaetotaxy: 0:6:(0)6[0?](0):(1)6(1):6:6:6:8?:7:T1T4T1T?:2. Coxal chaetotaxy: 3:5:2-5:4.

Dimensions (mm): Body length 2.4; pedipalps: trochanter 0.37-0.38/0.21, femur 0.58-0.59/0.21-0.22, tibia 0.47/0.205, chela (with pedicel) 0.895/0.245, chela (without pedicel) 0.855, moveable finger length 0.43; chelicera 0.17/0.09, moveable finger length 0.12; carapace 0.82/0.60; leg I: coxa 0.33/0.27, trochanter 0.12-0.13/0.10, femur I 0.12/0.12, femur II 0.17/0.12, tibia 0.21/0.075, tarsus 0.12-0.13/0.05; leg IV: coxa width 0.24-0.26, trochanter 0.15-0.17/0.13-0.15, femur I 0.22/0.20, femur II 0.26/0.20-0.21, tibia 0.35-0.36/0.12-0.13, tarsus 0.19/0.08-0.085.



Figs. 78-79.—*Afrosternophorus aethiopicus* (Beier), male holotype: 78, ventral aspect of right pedipalp; 79, dorsal aspect of carapace. Scale line = 1.00 mm.

Habitat.—No habitat data accompanied the specimen.

Remarks.—The single available specimen is in poor condition and the sclerotized portions of the genitalia are ill-defined. The left pedipalpal tibia and chela were missing from the specimen.

Afrosternophorus ceylonicus (Beier), new combination

Figs. 53, 65-66, 80-85, 90; Map 4

Sternophorus ceylonicus Beier 1973b:47, Fig. 11.

Sternophorus indicus Murthy and Ananthakrishnan 1977:119-121, Fig. 39. NEW SYNONYMY.

Sternophorus (*Sternophorus*) *transiens* Murthy and Ananthakrishnan 1977:121-123, Fig. 40. NEW SYNONYMY.

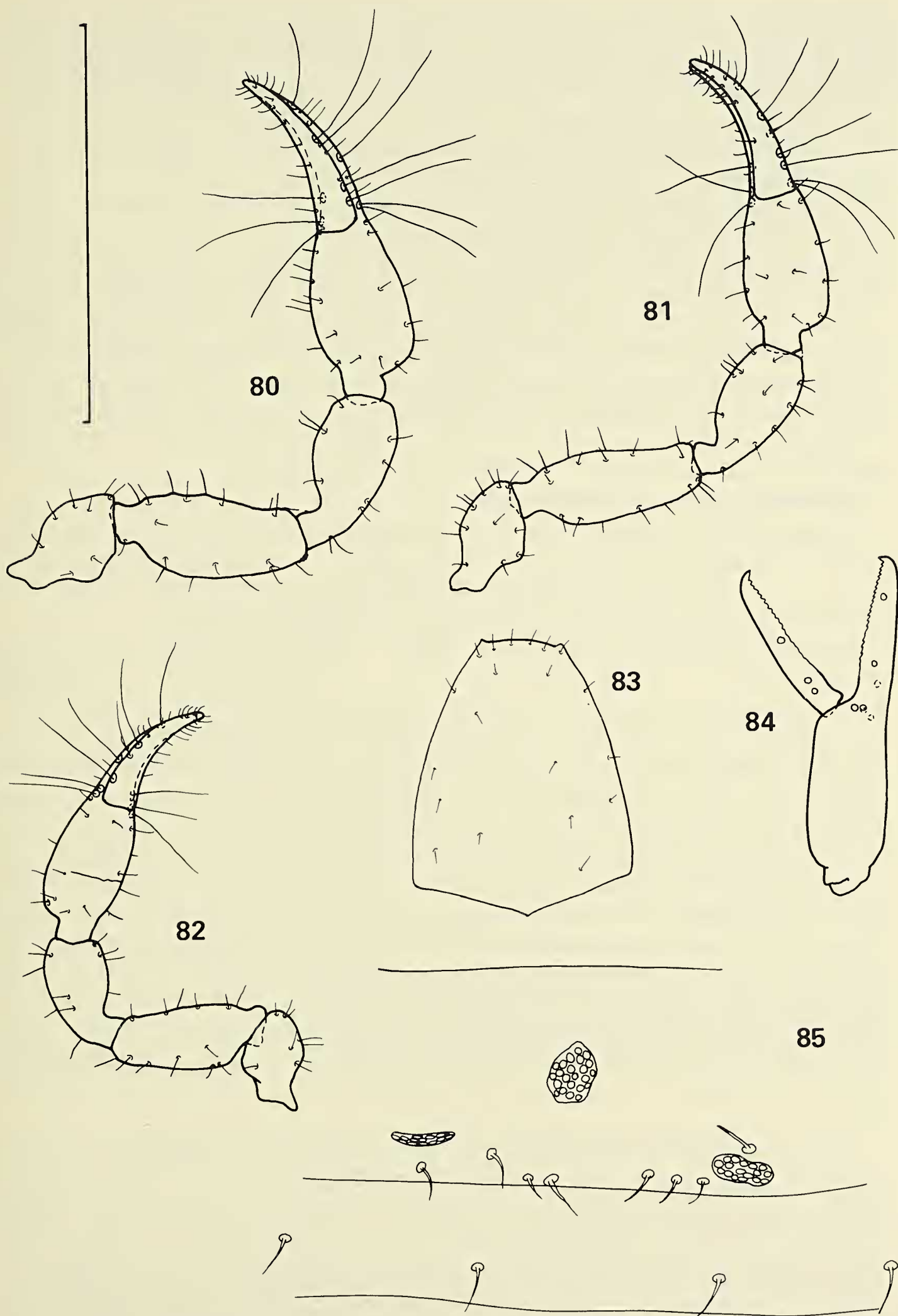
Sternophorus (*Sternophorus*) *montanus* Sivaraman 1981:315-317, Fig. 1. NEW SYNONYMY.

Sternophorus (*Afrosternophorus*) *femoratus* Sivaraman 1981:317-319, Fig. 2. NEW SYNONYMY.

Sternophorus (*Afrosternophorus*) *intermedius* Sivaraman 1981:319-321, Fig. 3. NEW SYNONYMY.

Indogaryops amrithiensis Sivaraman 1981:322-324, Fig. 4. NEW SYNONYMY.

Types.—*Sternophorus ceylonicus*: Lectotype male (present designation), paralectotype female, Chemiyanpattu, 18 mi. [= 29 km] SE of Point Pedro, North Province, Sri Lanka, under bark of tree-like bush, 13 February 1962 (Brink, Anderson, Cederholm), LU, Type No. 539 (spirit). Paralectotype male, same data as above, NHMW (spirit). Two paralectotype males, paralectotype female, paralectotype tritonymph, Per Aru, 9 mi. [= 14.5 km] E of Mankulan, North Province, Sri Lanka, under log, 14 February 1962 (Brink, Anderson, Cederholm), LU, Type No. 539 (slides and spirit). Two males, same data as above,



Figs. 80-85.—*Afrosternophorus ceylonicus* (Beier): 80, ventral aspect of left pedipalp, female paralectotype from Chemiyanpattu, Sri Lanka; 81, same, male lectotype; 82, ventral aspect of right pedipalp, tritonymph paralectotype from Per Aru, Sri Lanka; 83, dorsal aspect of carapace, male paralectotype from Per Aru; 84, lateral aspect of left chela, female paralectotype from Per Aru; 85, female genitalia and associated sternites, paralectotype from Per Aru. Scale line = 1.00 mm (Figs. 80-84), 0.25 mm (Fig. 85).

NHMW (spirit). Two paralectotype males, two paralectotype females, 5 mi. [= 8 km] NNE of Puttalam, North-West Province, Sri Lanka, 1 February 1962 (Brink, Anderson, Cederholm), NHMW (spirit). Five paralectotype males, five paralectotype females, same data as above, LU, lost (see Remarks).

Sternophorus indicus: Three paratype males, Tirupathi, Andhra Pradesh, India, under bark, 14 August 1960 (V. A. Murthy), VAM (slides).

Sternophorus transiens: Paratype male, paratype female, Shimoga, Karnataka, India, under bark, 4 January 1963 (V. A. Murthy), VAM (slides).

Sternophorus montanus: Holotype male, paratype female, Alakarkoil Hill forest, Madurai, Tamil Nadu, India, under bark, 15 July 1977 (S. Sivaraman), MHNG (slides).

Sternophorus femoratus: Holotype female, paratype male, Amrithi forest, North Arcot, Tamil Nadu, India, under bark, 2 October 1977 (S. Sivaraman), MHNG (slides).

Sternophorus intermedius: Holotype female, paratype male, Alakarkoil Hill forest, Madurai, Tamil Nadu, India, under bark, 15 July 1977 (S. Sivaraman), MHNG (slides).

Indogaryops amrithiensis: Holotype female, Amrithi forest, North Arcot, Tamil Nadu, India, under bark, 2 October 1977 (S. Sivaraman), MHNG (slide).

Distribution.—India, Sri Lanka (Map 4).

Diagnosis.—Male genitalia with short, but prominent, slightly curved dorsal apodemes; lateral rod lying anteriorly to the rest of the genital armature. Female galea with two distal and one subdistal to subbasal rami. Chelal fingers long and strongly curved. Chela (with pedicel) 0.75 to 0.835 (male), 0.80 to 0.94 mm (female) in length.

Description.—ADULTS: Pedipalpal trochanter 1.63 to 1.79 (male), 1.64 to 1.84 (female), femur 2.47 to 2.86 (male), 2.48 to 2.81 (female), tibia 2.00 to 2.29 (male), 1.95 to 2.29 (female), chela (with pedicel) 3.39 to 3.76 (male), 3.35 to 3.72 (female), chela (without pedicel) 3.20 to 3.56 (male), 3.20 to 3.50 (female) times longer than broad. Chelal fingers long and strongly curved (Figs. 80-81). Trichobothria as for *aethiopicus* group, in usual position (Figs. 80-81, 84). Serrula exterior of chelicera with 10 to 12 (male), 11 to 13 (female) lamellae. Galea of male simple, of female with two distal and one subdistal to subbasal rami (Figs. 65-66). Carapace usually unconstricted (Fig. 83), but sometimes a slight constriction is present, with 20 to 30 (male), 22 to 28 (female) setae; 1.26 to 1.46 (male), 1.21 to 1.33 (female) times longer than broad. Male genitalia (Fig. 53) with short, but prominent, slightly curved dorsal apodemes; lateral rod lying anteriorly to the rest of the genital armature. Female genitalia as for genus (Fig. 85). Tergal chaetotaxy: male, 5-6:4-6:3-4:6-7:5-7:5-7:6-7:5-7:4-8:T1T3-5T1T:?:2; female, 5-7:4-6:3-5:5-7:4-7:6-8:5-7:6-8:6-8:T1T3-4T1T:?:2. Sternal chaetotaxy: male, 0:4-8:(0)3-4[4-6](0):(1)4-5(1):5-8:6-7:6:6-7:6:T1T3-4T1T:?:2; female, 0:7-8:(0)4(0):(1)4-6(1):5-8:5-8:6-7:6-7:4-8:T1T4T1T:?:2. Coxal chaetotaxy: male, 3-5:3-6:3-5:3-5; female, 3-5:3-5:2-5:3-6.

Dimensions (mm): Body length 1.7-2.1 (2.1-2.9); pedipalps: trochanter 0.28-0.32/0.16-0.195 (0.295-0.36/0.17-0.20), femur 0.465-0.535/0.175-0.205 (0.495-0.605/0.18-0.225), tibia 0.375-0.44/0.175-0.205 (0.40-0.51/0.185-0.225), chela (with pedicel) 0.75-0.835/0.205-0.24 (0.80-0.94/0.22-0.27), chela (without pedicel) 0.72-0.80 (0.755-0.92), moveable finger length 0.37-0.43 (0.41-0.48); chelicera 0.155-0.175/0.09-0.095 (0.18-0.185/0.10-0.115), moveable finger length 0.11-0.13 (0.12-0.14); carapace 0.68-0.76/0.51-0.595 (0.74-0.89/0.56-0.68); leg I: coxa 0.19-0.23/0.235-0.255/0.26-0.30, trochanter 0.095-0.135/0.09-0.10 (0.12-0.15/0.095-0.11), femur I 0.095-0.115/0.10-0.12 (0.12-0.14/0.11-0.135), femur II 0.15-0.18/0.10-0.12 (0.17-0.20/0.11-0.135), tibia 0.17-0.21/0.065-0.08 (0.20-0.22/0.075-0.085), tarsus 0.105-0.13/0.05-0.055 (0.13-0.14/

0.05-0.055); leg IV: coxa width 0.21-0.26 (0.275-0.305), trochanter 0.14-0.175/0.105-0.12 (0.165-0.195/0.12-0.13), femur I 0.17-0.195/0.14-0.185 (0.215-0.24/0.175-0.18), femur II 0.22-0.26/0.14-0.19 (0.26-0.28/0.18-0.185), tibia 0.27-0.33/0.10-0.115 (0.32/0.105), tarsus 0.17-0.185/0.06-0.075 (0.18/0.07).

TRITONYMPHS: Pedipalpal trochanter 1.66 to 1.68, femur 2.44 to 2.52, tibia 2.00 to 2.03, chela (with pedicel) 3.47 to 3.63, chela (without pedicel) 3.32 to 3.39 times longer than broad. Fixed finger with seven trichobothria, moveable finger with two trichobothria (Fig. 82); *it*, *sb* and *st* absent. Serrula exterior of chelicera with 10 lamellae, Galea as for female. Carapace unconstricted, with 20 setae; 1.25 times longer than broad. Tergal chaetotaxy: 4:4:6:6:6?:6:6:6:6:T1T3T1T?:2. Sternal chaetotaxy: 0:2:(0)4(0):(1)4(1):6:6:6:6:6:T1T3T1T?:2. Coxal chaetotaxy: 4:3-4:3:2.

Dimensions (mm): Body length 1.9; pedipalps: trochanter 0.235-0.24/0.14-0.145, femur 0.39/0.155-0.16, tibia 0.31-0.315/0.155, chela (with pedicel) 0.66-0.69/0.19, chela (without pedicel) 0.63-0.645, moveable finger length 0.32-0.34; carapace 0.69/0.55.

Habitat.—The Chemiyanpattu specimens were taken from under bark of a “tree-like bush” and the Per Aru specimens were taken from under logs in jungle. Murthy and Ananthakrishnan’s and Sivaraman’s material was all taken from under bark.

Remarks.—Unfortunately, one vial containing type material (5 males, 5 females, Puttalam, Sri Lanka) was lost in transit from Lund to Monash University.

Beier (1973b) did not designate a primary type, and merely published and labelled some Chemiyanpattu specimens as “Typen”. A lectotype male has been selected from this vial.

Through the characteristic generosity of Prof. V. A. Murthy, I have been able to examine some type specimens of *S. indicus* and *S. transiens*, as well as many other specimens from southern India. The type material of *S. montanus*, *S. femoratus*, *S. intermedius* and *I. amrithiensis* was also available for study. All of this material possesses the characteristic chelal finger shape, female galea and, most importantly, male genitalia of *A. ceylonicus*, and therefore these species are hereby synonymized with *ceylonicus*. Murthy and Ananthakrishnan (1977) erroneously included the chelal trichobothria *it* and *st* in their description and diagram of *S. indicus*. My examination of three paratypes reveals that these trichobothria are absent, as in all sternophorids.

Other specimens examined.—INDIA: TAMIL NADU; Alakarkoil Hill forest, Madurai, under bark, 15 July 1977 (S. Sivaraman), 3 males, 1 female (VAM) (spirit). Amrithi forest, North Arcot, under bark, 2 October 1977 (S. Sivaraman), 1 male, 1 female (VAM) (spirit). Same data as above except, date? (V. A. Murthy), 3 males, 1 tritonymph (ANIC, MH472.01-04) (spirit). No locality data, 2 males, 2 females (VAM) (spirit).

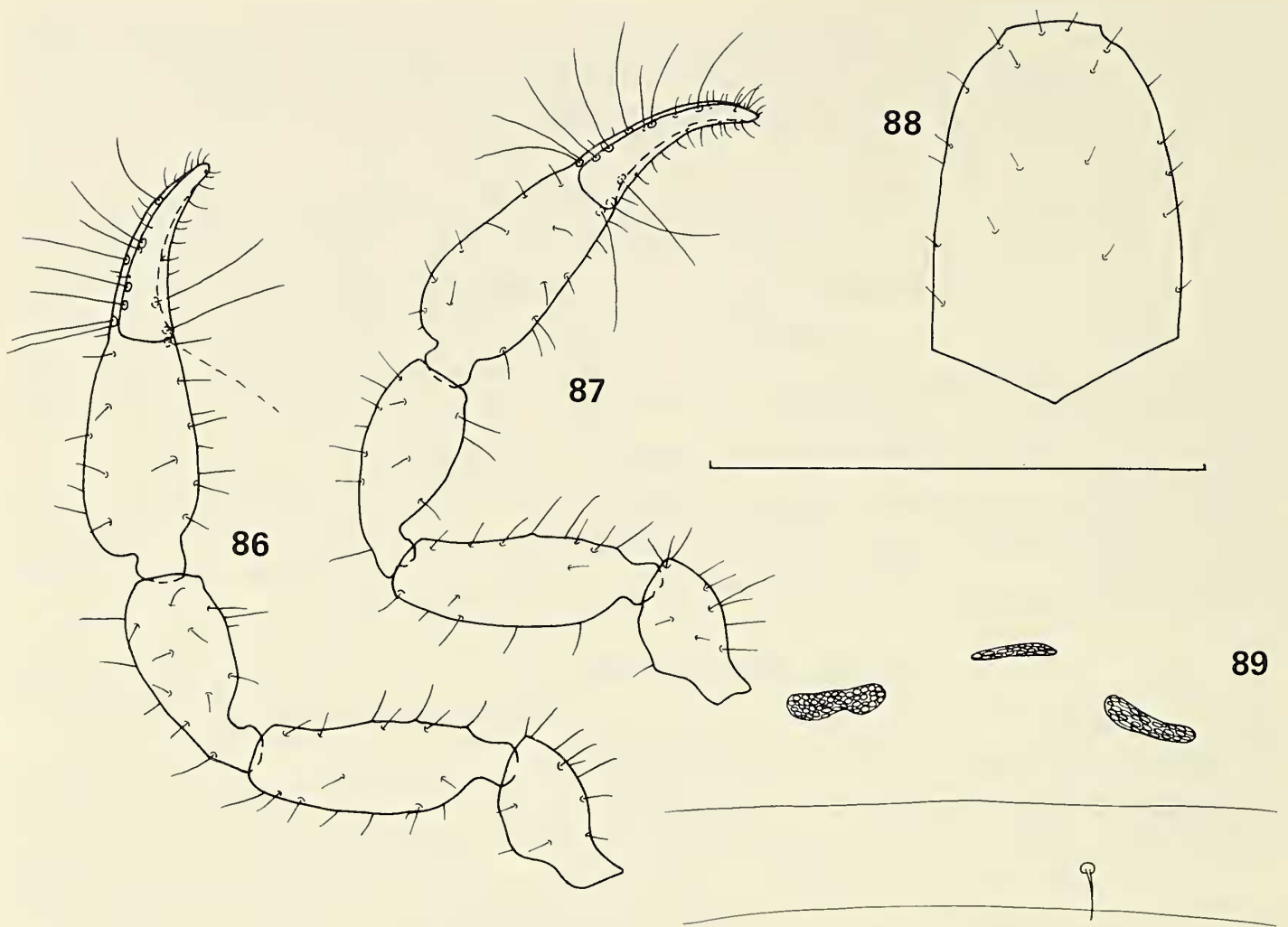
Afrosterphorus chamberlini (Redikorzev), new combination

Figs. 54, 67, 86-90; Map 4

Sternophorus chamberlini Redikorzev 1938:89-91, Figs. 17-18; Beier 1951:71-72, Fig. 16 (in part).

Types.—Lectotype female (present designation), Dalat [= Đà Lạt, see Table 1], Vietnam, January 1931 (C. Dawydoff), MNHN (spirit). Paralectotype female, same data as lectotype except 3 February 1931, MNHN (spirit). One specimen, Abre-Broyé [= Ấp Trạm Hahn], Plateau du Lang-Biang [= Cao Nguyên Lâm Viên], Vietnam, 1,500 m, 20 January 1931 (C. Dawydoff), depository unknown, not examined.

Distribution.—Vietnam, Laos? (Map 4).



Figs. 86-89.—*Afrosternophorus chamberlini* (Redikorzev): 86, ventral aspect of right pedipalp, female; 87, same, male; 88, dorsal aspect of carapace, male; 89, female genitalia and associated sternites. Scale line = 1.00 mm (Figs. 86-88), 0.25 mm (Fig. 89).

Diagnosis.—Male genitalia with long, acute dorsal apodemes; mid-piece of lateral rod elongate. Female galea with two distal, one subdistal and three subbasal rami. Chela (with pedicel) 0.74 to 0.81 (male), 0.74 to 0.90 mm (female) in length.

Description.—Pedipalpal trochanter 1.79 to 1.87 (male), 1.75 to 2.00 (female), femur 3.00 to 3.16 (male), 2.73 to 3.17 (female), tibia 2.18 to 2.39 (male), 2.13 to 2.35 (female), chela (with pedicel) 3.68 to 3.95 (male), 3.47 to 4.20 (female), chela (without pedicel) 3.55 to 3.74 (male), 3.30 to 3.98 (female) times longer than broad. Trichobothria as for *aethiopicus* group, in usual position (Figs. 86-87). Serrula exterior of chelicera with 10 to 11 (male), 11 to 12 (female) lamellae. Galea of male simple, of female with two distal, one subdistal and three subbasal rami (Fig. 67). Carapace (Fig. 88) unconstricted, with 23 (male), 22 to 28 (female) setae; 1.50 to 1.51 (male), 1.44 to 1.56 (male) times longer than broad. Male genitalia with long, acute dorsal apodemes; mid-piece of lateral rod elongate (Fig. 54). Female genitalia as for genus (Fig. 89). Tergal chaetotaxy: male, 6:5:2:6:6:7:6:7:T1T4T1T?:2; female, 6:4-6:2-4:6:6-8?:6-7:5-8:5-8:6-8:T1T4T1T?:2. Sternal chaetotaxy: male, 0:5:(0)5[8](0):(1)6(1):8:8:6:7:6:T1T4T1T?:2; female, 0:6-9:(0)5-6(0):(1)6(1):5?-9:4-9:7-8:6:6-7:T1T4T1T?:2. Coxal chaetotaxy: male, 4-5:3-5:5:4; female, 3-6:4-6:3-6:3-5.

Dimensions (mm): Body length 1.6-1.8 (2.0-2.7); pedipalps: trochanter 0.285-0.305/0.155-0.17 (0.28-0.36/0.16-0.19), femur 0.48-0.53/0.155-0.175 (0.45-0.59/0.165-0.205), tibia 0.37-0.44/0.165-0.185 (0.37-0.49/0.165-0.215), chela (with pedicel) 0.74-0.81/0.195-0.22 (0.74-0.90/0.20-0.25), chela (without pedicel) 0.705-0.78 (0.705-0.865), moveable finger length 0.345-0.38 (0.36-0.40); chelicera 0.13-0.16/0.08-0.09 (0.15-0.17/0.08-0.10), moveable finger length 0.105-0.115 (0.105-0.12); carapace 0.665-0.69/

0.44-0.46 (0.64-0.86/0.49-0.555); leg I: coxa 0.185-0.19/0.20-0.21 (0.195-0.22/0.21-0.25), trochanter 0.105-0.11/0.07 (0.11-0.12/0.075-0.08), femur I 0.10/0.105-0.11 (0.105-0.12/0.095-0.11), femur II 0.14/0.10-0.11 (0.15-0.16/0.095-0.105), tibia 0.16-0.165/0.065 (0.18/0.07), tarsus 0.10-0.11/0.045 (0.11-0.12/0.045); leg IV: coxa width 0.18-0.21 (0.21-0.24), trochanter 0.12-0.155/0.09-0.10 (0.15-0.165/0.10-0.11), femur I 0.175-0.20/0.15-0.18 (0.205/0.165), femur II 0.205-0.255/0.14-0.18 (0.22/0.165), tibia 0.275-0.32/0.09-0.10 (0.275-0.32/0.09-0.10), tarsus 0.165-0.17/0.065 (0.16-0.17/0.06-0.07).

Habitat.—No habitat data accompanied the specimens.

Remarks.—Redikorzev did not designate a holotype and thus a lectotype has been selected. Beier's (1951) material was composed of two species: *chamberlini* and *fallax*, new species. *Afrosterphorus fallax* is substantially different from *A. chamberlini* and can be separated by several characters, particularly the presence of only two trichobothria on the moveable chelal finger. Beier's (1951) description of *chamberlini* was a composite of these two species. His male pedipalp measurements were of *fallax*, and his female measurements were of *chamberlini*.

Beier (1951) erroneously included the chelal trichobothrium *it* in his diagram of this species. He also recorded one female from Plateau des Bolovens, Laos. This specimen needs to be re-examined to determine its true status. A deutonymph of *Stenatemnus annamensis* Beier (?) was present in one vial.

The NHMW material is in poor condition, and few specimens could be fully scored for setation or leg measurements.

Specimens examined.—VIETNAM: Plateau von Langbian [= Cao Nguyên Lâm Viên], 1938-1939 (C. Dawydoff), 3 males, 9 females (NHMW) (spirit).

Afrosterphorus dawydoffi (Beier), new combination

Figs. 55, 68, 90-97; Map 4

Sternophorus dawydoffi Beier 1951:70-71, Fig. 15.

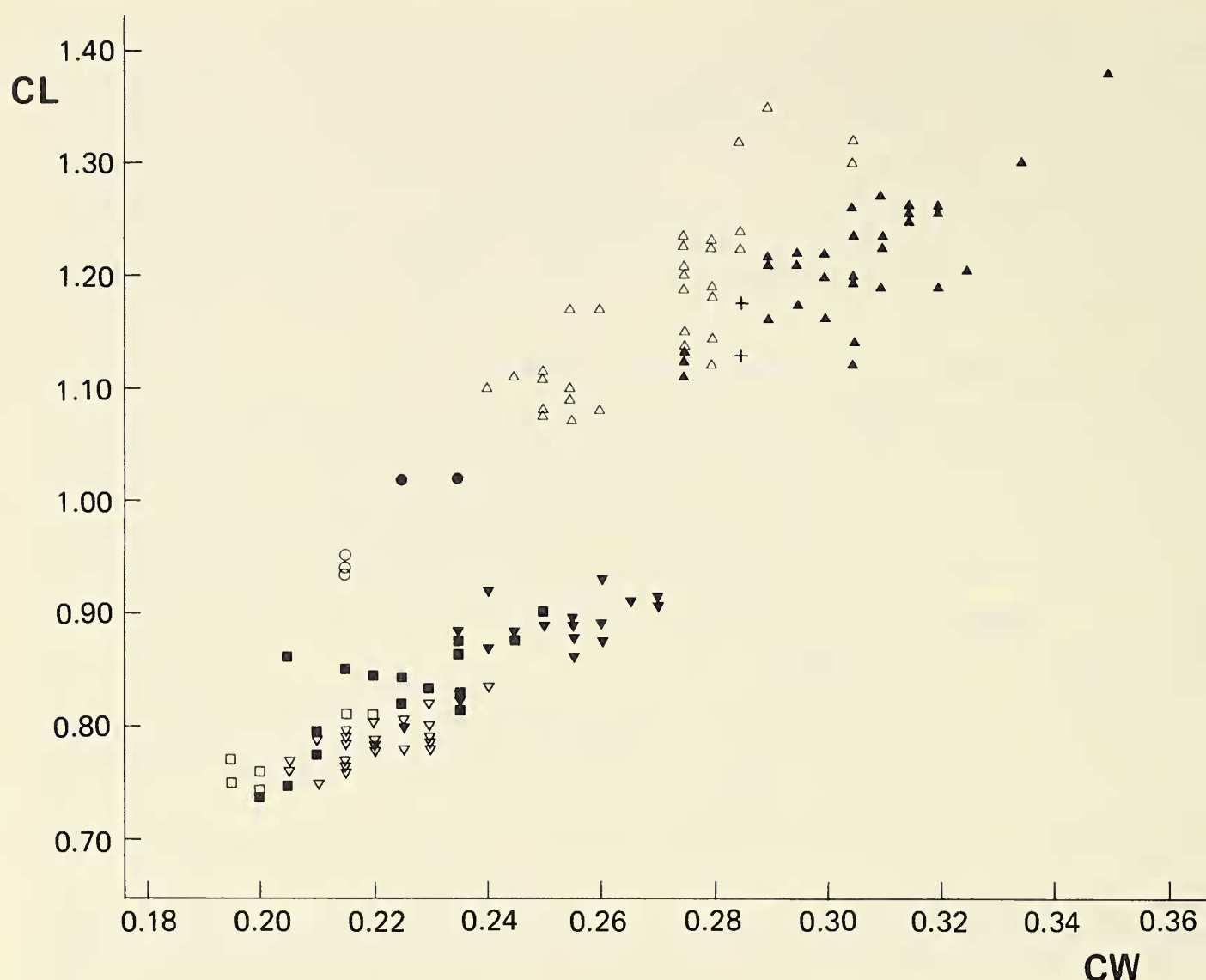
Sternophorus cylindrimanus Beier 1951:73-74, Fig. 17 (in part).

Types.—*Sternophorus dawydoffi*: Lectotype male (present designation), four paralectotype males, two paralectotype females, Rusei Chrum [= Roessei Chrum, see Table 1], Kampuchea, March 1939 (C. Dawydoff), NHMW (spirit). Paralectotypes: one male, one female, same data as above, ANIC, MH430.01-02 (slides). One male, two females, same locality as above, April 1939 (C. Dawydoff), NHMW (spirit). One male, three females, Beng Mealea [= Phum Boëng Méalea], Kampuchea, April 1939 (C. Dawydoff), NHMW (spirit). Two females, Phailin [= Pailin], Kampuchea, March 1939 (C. Dawydoff), NHMW (spirit). Two males, three females, Prah Khan [= Prasat Preăh Khă], Kampuchea, April 1939 (C. Dawydoff), NHMW (spirit). Five males, two females, Réam [= Phsar Ream], Kampuchea, April 1939 (C. Dawydoff), NHMW (spirit). Two males, one female, Sré Umbell [= Sré Âmběl], Kampuchea, March 1939 (C. Dawydoff), NHMW (spirit). One male, three females, Insel Phu-Quoc [= Đảo Phú Quốc], Vietnam, March 1939 (C. Dawydoff), NHMW (spirit).

Sternophorus cylindrimanus: Paralectotype female, Krongpha [= Thôn Sông Pha], Vietnam, 30 April 1939 (C. Dawydoff), NHMW (spirit).

Distribution.—Kampuchea, Vietnam (Map 4).

Diagnosis.—Male genitalia with long, acute dorsal apodemes. Female galea with six (sometimes five) distal to subdistal rami. Large species: chela (with pedicel) 1.07 to 1.35 (male), 1.11 to 1.38 mm (female) in length.



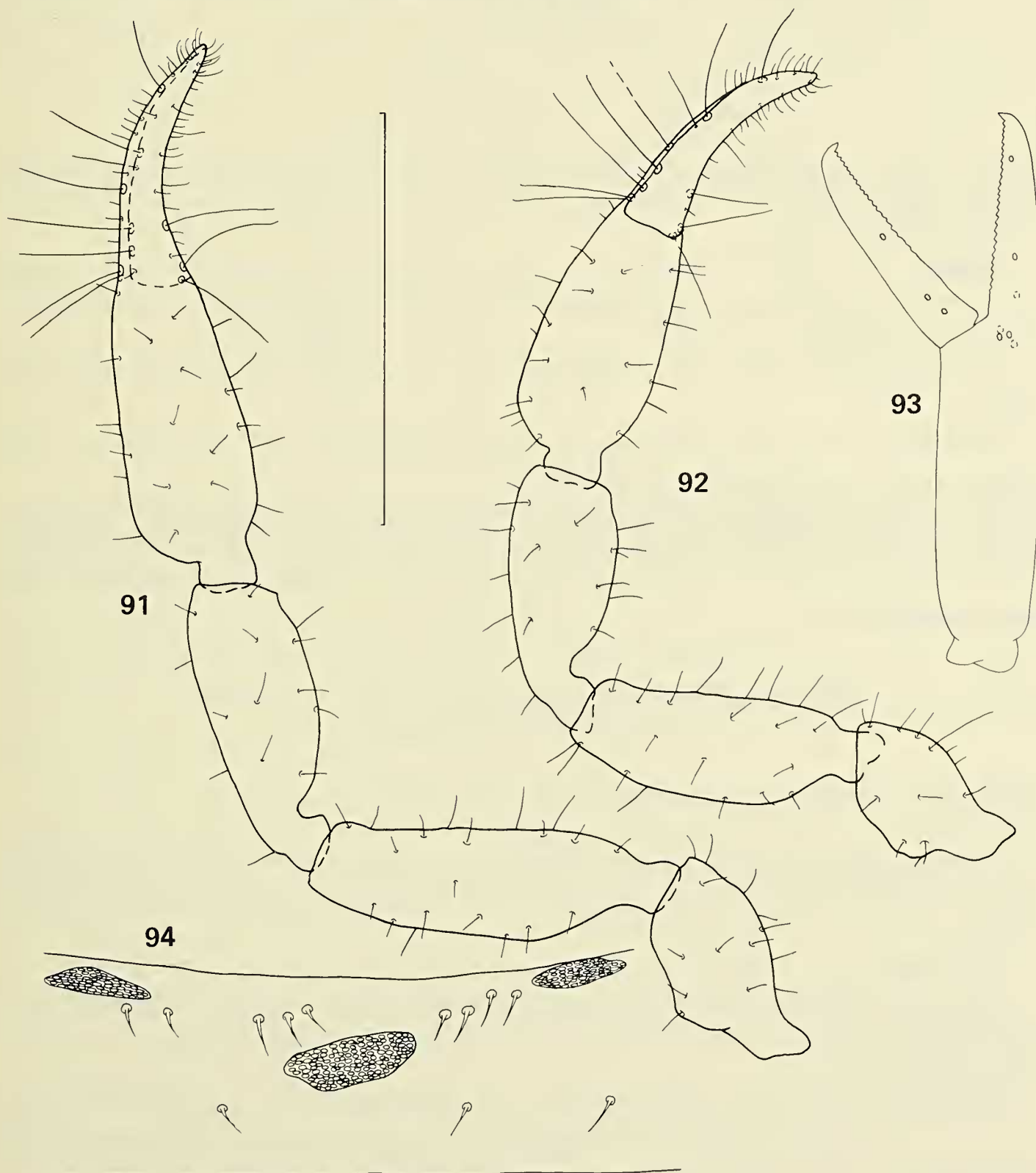
Figs. 90.—Graph of chela (with pedicel) length (CL) versus width (CW), in mm; open symbols, males; closed symbols, females: *Afrosterphorus ceylonicus* (Beier) (inverted triangles), *A. chamberlini* (Redikorzev) (squares), *A. dawydoffi* (Beier) (upright triangles), *A. dawydoffi*, paralectotype female of *A. cylindrimanus* (Beier) (crosses), *A. cylindrimanus* (circles).

Description.—Pedipalpal trochanter relatively inflated, 1.88 to 2.27 (male), 1.81 to 2.02 (female), femur elongate, 3.18 to 3.72 (male), 2.96 to 3.30 (female), tibia 2.60 to 2.88 (male), 2.35 to 2.63 (female), chela (with pedicel) 4.00 to 4.46 (male), 3.67 to 4.13 (female), chela (without pedicel) 3.84 to 4.40 (male), 3.44 to 3.97 (female) times longer than broad. Trichobothria as for *aethiopicus* group, in usual position (Figs. 91-93). Serrula exterior of chelicera with 12 to 15 (male), 11 to 15 (female) lamellae. Galea of male simple, of female with six (occasionally five) distal to subdistal rami (Fig. 68). Carapace usually unconstricted (Fig. 95), but sometimes a slight (Fig. 96) or a conspicuous constriction is present (Fig. 97), with 24 to 32 (male), 24 to 31 (female) setae; 1.24 to 1.52 (male), 1.30 to 1.55 (female) times longer than broad. Male genitalia with long, acute dorsal apodemes (Fig. 55). Female genitalia as for genus (Fig. 94). Tergal chaetotaxy: male, 4-6:4-6:3-4:4-6:5-6:5-7:6:6-7:6:T1T4-5T1T?:2; female, 4-6:5-6:2-4:4-7:6:5-6:4-7:5-7:5-6:T1T4T1T?:2. Sternal chaetotaxy: male, 0:2-6:(0)4-6[7-8](0):(1)4-6(1):4-9:6-8:5-6:5-8:5-7:T1T4T1T?:2; female, 0:5-9:(0)4-5(0):(1)4-6(1):6:5-6:6:6-7:5-7:T1T4T1T?:2. Coxal chaetotaxy: male, 3-6:3-6:3-7:3-5; female, 3-6:3-6:3-6:3-5.

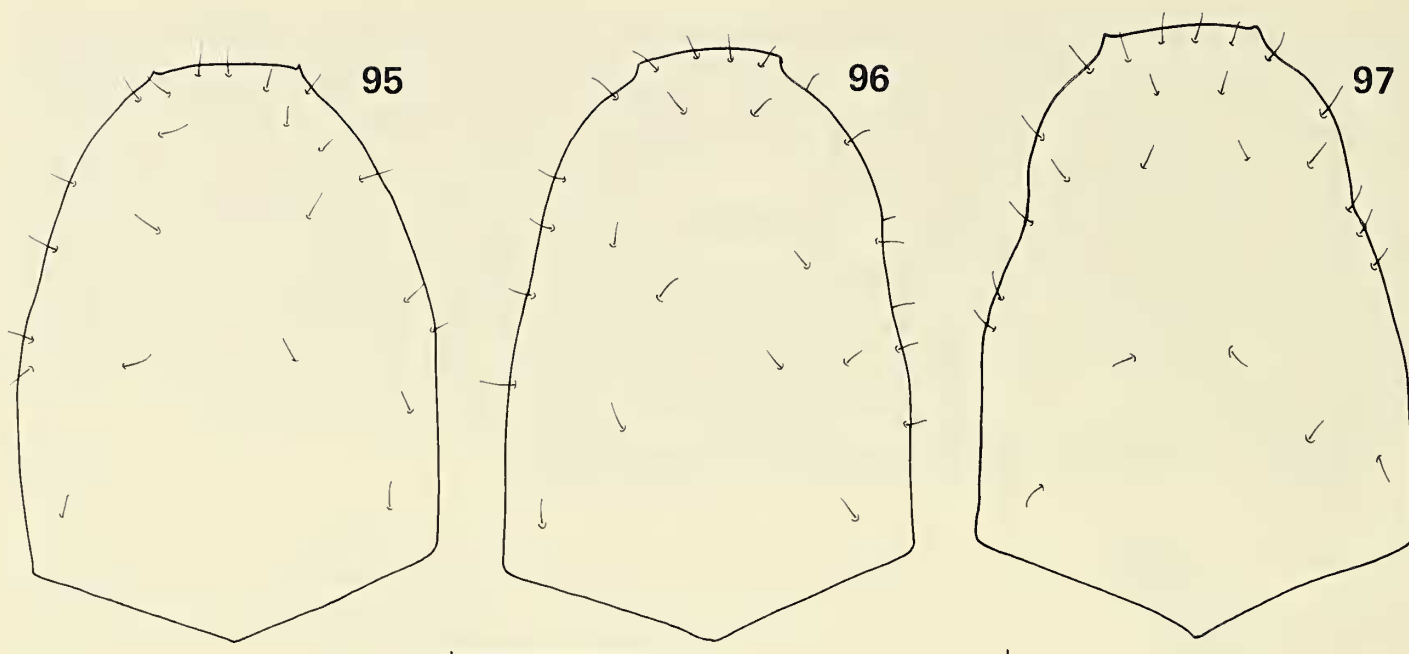
Dimensions (mm): Body length 2.0-3.3 (2.4-3.3); pedipalps: trochanter 0.43-0.545/0.215-0.265 (0.44-0.555/0.23-0.29), femur 0.72-0.93/0.21-0.27 (0.74-0.95/0.23-0.295), tibia 0.60-0.77/0.22-0.275 (0.595-0.76/0.24-0.305), chela (with pedicel) 1.07-1.35/0.24-0.305 (1.11-1.38/0.275-0.35), chela (without pedicel) 1.02-1.275 (1.05-1.32), moveable finger length 0.47-0.61 (0.53-0.66); chelicera 0.20-0.23/0.11-0.13 (0.21-0.28/

0.12-0.14), moveable finger length 0.14-0.16 (0.15-0.175); carapace 0.90-1.13/0.645-0.795 (0.96-1.215/0.71-0.83); leg I: coxa 0.25-0.31/0.29-0.36 (0.275-0.35/0.32-0.41), trochanter 0.145-0.185/0.105-0.125 (0.15-0.20/0.11-0.14), femur I 0.13-0.165/0.14-0.175 (0.15-0.19/0.15-0.19), femur II 0.24-0.30/0.14-0.18 (0.25-0.315/0.15-0.19), tibia 0.25-0.29/0.085-0.115 (0.26-0.32/0.095-0.115), tarsus 0.12-0.175/0.06-0.07 (0.15-0.195/0.06-0.075); leg IV: coxa width 0.27-0.33 (0.29-0.37), trochanter 0.20-0.25/0.14-0.16 (0.21-0.275/0.14-0.175), femur I 0.255-0.305/0.22-0.285 (0.27-0.345/0.25-0.325), femur II 0.39-0.51/0.225-0.285 (0.40-0.50/0.25-0.33), tibia 0.405-0.51/0.13-0.165 (0.45-0.56/0.14-0.18), tarsus 0.205-0.255/0.08-0.10 (0.23-0.27/0.075-0.105).

Habitat.—No habitat data accompanied the specimens.



Figs. 91-94.—*Afrosterphorus dawydoffi* (Beier): 91, dorsal aspect of left pedipalp, male lectotype; 92, ventral aspect of right pedipalp, female paralectotype from Roessei Chrum, Kampuchea; 93, lateral aspect of left chela, male paralectotype, MH430.01; 94, female genitalia and associated sternites, paralectotype from Roessei Chrum. Scale line = 1.00 mm (Figs. 91-93), 0.25 mm (Fig. 94).



Figs. 95-97.—*Afrosternophorus dawydoffi* (Beier), dorsal aspect of carapace, specimens from Roessei Chrum, Kampuchea: 95, female paralectotype; 96, male lectotype; 97, female paralectotype. Scale line = 1.00 mm.

Remarks.—The anterior constriction of the carapace of this species is quite variable (Figs. 95-97; all specimens from Roessei Chrum) and clearly shows that this character cannot be used at the generic level.

The female paralectotype of *S. cylindrimanus* referred to above is discussed under that species.

Beier (1951) erroneously included the chelal trichobothrium *it* in his diagram of this species, as well as mis-sexing many specimens.

Beier did not designate a primary type in the original description, and merely published and labelled one vial as "Typen". A lectotype male has been selected from this vial.

The alternative spelling of the localities given above is discussed in the Materials and Methods and Table 1.

Afrosternophorus cylindrimanus (Beier), new combination

Figs. 69, 90, 98-100; Map 4

Sternophorus cylindrimanus Beier 1951:73-74, Fig. 17 (in part).

Types.—Lectotype male (present designation), paralectotype male, paralectotype female, Paclay [= Pak-Lay, see Table 1], Laos, January 1938 (C. Dawydoff), NHMW (spirit).

Distribution.—Laos (Map 4).

Diagnosis.—Male genitalia with long, acute dorsal apodemes. Female galea with four distal and one subbasal rami. Chela (with pedicel) 0.935 to 0.95 (male), 1.02 mm (female) in length.

Description.—Pedipalpal trochanter 1.95 to 2.00 (male), 2.00 to 2.05 (female), femur 3.31 to 3.37 (male), 3.42 to 3.50 (female), tibia 2.48 to 2.60 (male), 2.48 (female), chela (with pedicel) 4.37 to 4.42 (male), 4.34 to 4.53 (female), chela (without pedicel) 4.19 to 4.26 (male), 4.15 to 4.31 (female) times longer than broad. Trichobothria as for *aethiopicus* group, in usual position (Figs. 98-99). Serrula exterior of chelicera with 9 to 10 (male), 12 (female), lamellae. Galea of male simple, of female with four distal and one subbasal rami (Fig. 69). Carapace (Fig. 100), with 23 to 24 (male), ? (female) setae; 1.34



Map 4.—South-east Asia showing known distribution of *Afrosternophorus ceylonicus* (Beier) (circles), *A. chamberlini* (Redikorzev) (squares), *A. dawydoffi* (Beier) (upright triangles), *A. cylindrimanus* (Beier) (inverted triangles) and *A. fallax*, new species (star). Open symbols represent literature records only.

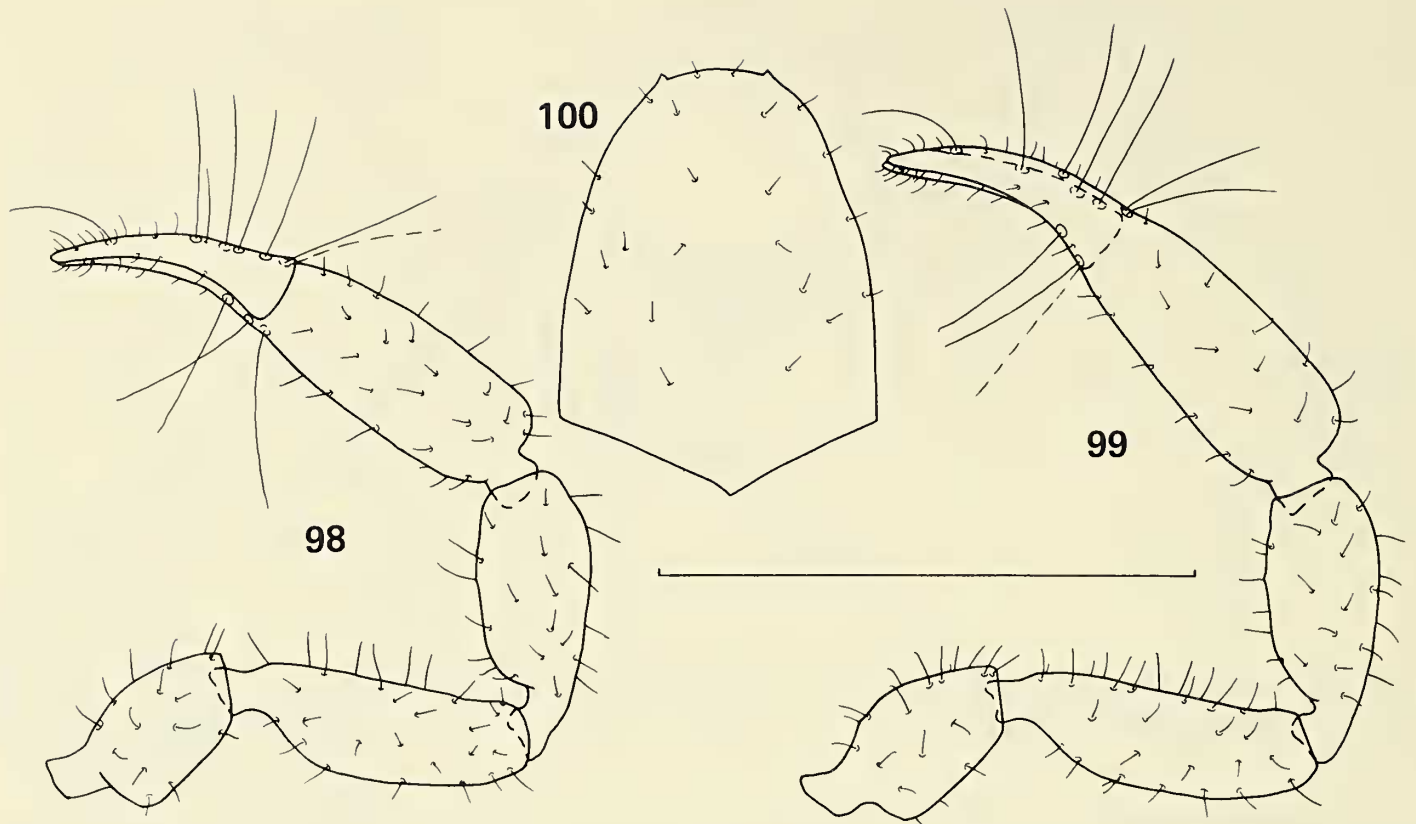
to 1.47 (male), 1.41 (female) times longer than broad. Male genitalia very obscure, dorsal apodemes long and acute. Female genitalia as for genus. Tergal chaetotaxy: male, 5-6:5-6:3-4:6:5-6:5-6:5-6:6:4-5:T1T?T1T?:2; female, ??:?:?:?:6:6:6:6:T1T4T1T?:2. Sternal chaetotaxy: male, ?; female, 0?:(0)?(0):(?)4(1):6:5:?:?:6:T1T4T1T?:2. Coxal chaetotaxy: male, 4:3:3-4:2; female, ?.

Dimensions (mm): Body length 2.1-2.2 (2.5); pedipalps: trochanter 0.37-0.39/0.19-0.195 (0.41-0.42/0.205), femur 0.59-0.605/0.175-0.18 (0.615-0.63/0.18), tibia 0.515-0.52/0.20-0.21 (0.52/0.21), chela (with pedicel) 0.935-0.95/0.215 (1.02/0.225-0.235), chela (without pedicel) 0.88-0.915 (0.97-0.975); chelicera 0.16/0.08-0.095 (?/?), moveable finger length 0.10-0.12 (?); carapace 0.75-0.765/0.52-0.56 (0.86/0.61); legs: ?.

Habitat.—No habitat data accompanied the specimens.

Remarks.—This species is very similar to *A. dawydoffi*, from which it can be separated only by its smaller size (Fig. 90) and the form of the female galea (Fig. 69). The latter character appears to be slightly variable, and may prove to be of little significance for these two species. Only further collecting will determine whether *A. cylindrimanus* is merely a smaller form of *A. dawydoffi*, and hence synonymous with it.

Beier (1951) described this species from two other specimens: a female from Louang-phrabang, Laos, and a female from Thôn Sông Pha, Vietnam. The former specimen was not available for study, and should be re-examined to determine its true status. It is geographically intermediate between the known distributions of *A. cylindrimanus* and *A. dawydoffi*, and may resolve the probable synonymy of these two species.



Figs. 98-100.—*Afrosternophorus cylindrimanus* (Beier): 98, ventral aspect of left pedipalp, male lectotype; 99, dorsal aspect of right pedipalp, female paralectotype; 100, dorsal aspect of carapace, male lectotype. Scale line = 1.00 mm.

Beier identified the Thôn Sông Pha specimen as *cylindrimanus* because it possessed a broad pseudosternum, which was his criterion for separating *dawydoffi* and *cylindrimanus*. My observations indicate that the relative sizes of the pseudosternum are variable and must be viewed with caution. The following values were obtained for the width of the pseudosternum over the width of the second coxa [the ratio used by Beier (1951)]: 3.00 to 6.00 for 11 specimens of *A. dawydoffi*; 1.65 to 2.12 for the two Pak-Lay males of *A. cylindrimanus* (the female was damaged and unmeasurable); and 2.08 for the Thôn Sông Pha female. Nevertheless, on the basis of pedipalpal morphometrics (Fig. 90) and distribution (Map 4), it is believed that the latter specimen is better placed in *A. dawydoffi*.

The Pak-Lay specimens are in poor condition, and many characters could not be properly scored or drawn (e.g. genitalia).

Beier (1951) erroneously included the chelal trichobothrium *it* in his diagram of this species.

Beier (1951) did not designate a primary type in his original description, and merely published and labelled one vial as "Typen". A lectotype male has been selected from this vial.

The alternative spelling of the type locality is discussed in the Materials and Methods and Table 1.

Afrosternophorus hirsti (Chamberlin), new combination

Figs. 1-7, 51, 56, 70-71, 101-108, 129; Map 5

Sternophorus hirsti Chamberlin 1932a:143; Beier 1932:18; Harvey 1981b:244.

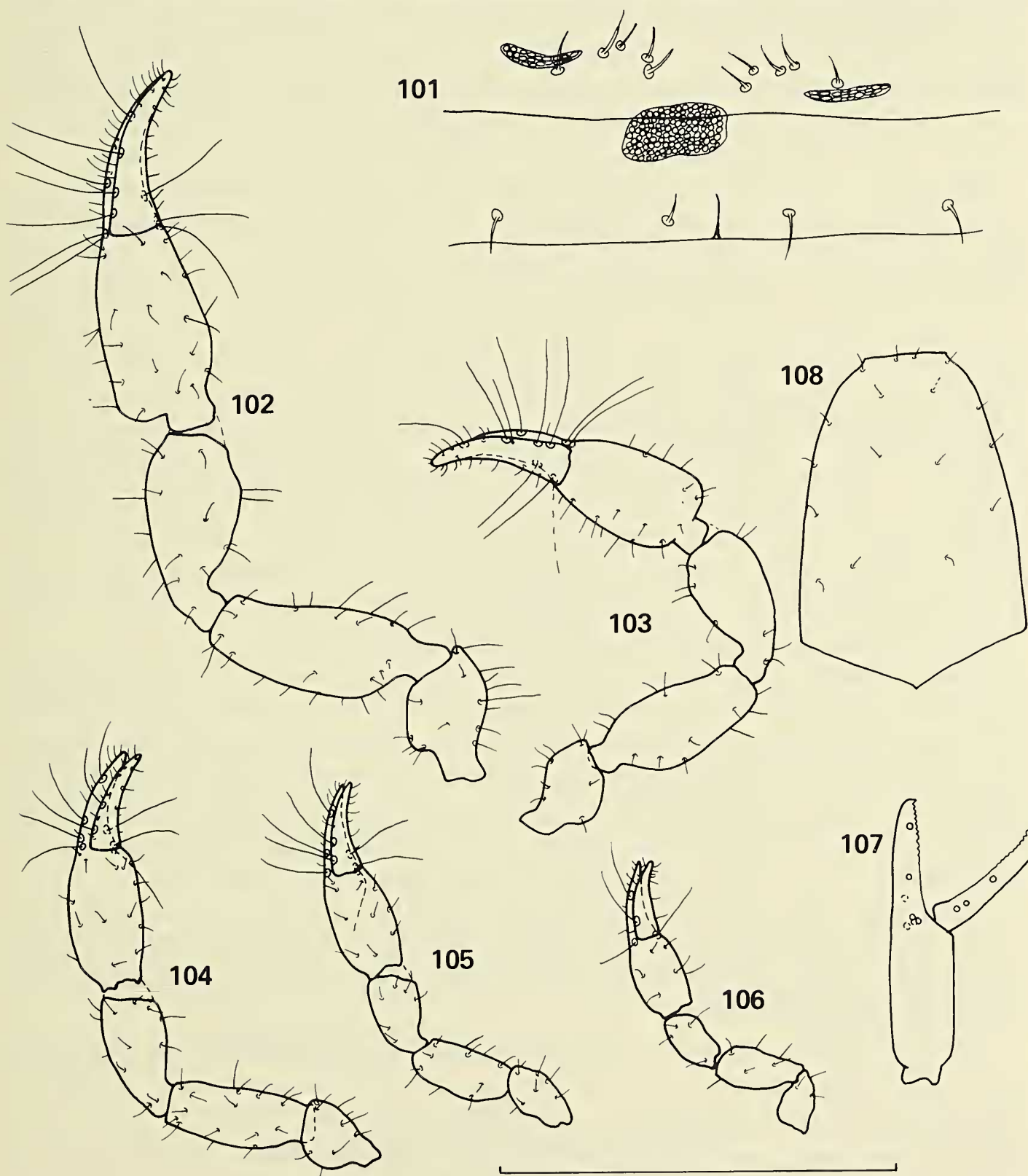
"*Sternophorus*" *hirsti* Chamberlin: Harvey 1982:192, Fig. 1.

Type.—Holotype male, Barrington, New South Wales, Australia, 1927 (F. S. Hirst), JCC, JC-480.01001 (slide).

Distribution.—New South Wales, Queensland, Australia (Map 5).

Diagnosis.—Male genitalia with brush-like anterior apodeme; dorsal apodemes parallel sided, much reduced. Female galea with three distal, one subdistal and one subbasal rami, the subdistal ramus occasionally absent. Chela (with pedicel) 0.715 to 0.815 (male), 0.66 to 0.91 mm (female) in length.

Description.—ADULTS: Pedipalpal trochanter 1.64 to 1.90 (male), 1.60 to 1.94 (female), femur 2.42 to 2.89 (male), 2.33 to 2.89 (female), tibia 2.05 to 2.44 (male), 1.96 to 2.35 (female), chela (with pedicel) 3.25 to 3.77 (male) 3.08 to 3.71 (female),



Figs. 101-108.—*Afrosternophorus hirsti* (Chamberlin): 101, female genitalia and associated sternites, MH302.24; 102, ventral aspect of right pedipalp, female, MH237.02; 103, ventral aspect of left pedipalp, male holotype; 104, ventral aspect of right pedipalp, tritonymph, MH237.05; 105, same, deutonymph, MH302.57; 106, same protonymph, MH237.07; 107, lateral aspect of right chela, male holotype; 108, dorsal aspect of carapace, female, MH210.03. Scale line = 1.00 mm (Figs. 102-108), 0.25 (Fig. 101).

chela (without pedicel) 3.11 to 3.58 (male), 2.94 to 3.55 (female) times longer than broad. Trichobothria as for *aethiopicus* group, in usual position (Figs. 1, 102-103, 107). One male (MH302.15) has *sb* missing from one chela. Serrula exterior of chelicera with 11 to 12 (male), 10 to 12 (female) lamellae. Galea of male simple, of female with three distal, one subdistal and one subbasal rami, the subdistal ramus occasionally absent (Figs. 70-71). Carapace (Figs. 2, 108) usually unconstricted, but sometimes a slight constriction is apparent, with 20 to 24 (male), 20 to 27 (female) setae; 1.43 to 1.67 (male), 1.32 to 1.55 (female) times longer than broad. Male genitalia (Figs. 51, 56) with distinctive brush-like anterior apodeme, dorsal apodemes parallel sided, much reduced; foramen relatively large. Female genitalia as for genus (Fig. 101). Tergal chaetotaxy: male, 4-7:3-6:4-6:4-7:5-7:5-7:6-7:5-7:5-6:T1T22-5T1T:?:2; female, 4-7:4-6:3-6:5-8:5-8:6-7:5-7:6-7:6-7:T1T2-4T1T:?:2. Sternal chaetotaxy: male, 0:3-8:(0)4-5[5-8](0):(1)3-6(1):5-8:5-7:5-7:4-7:5-6:T1T3-4T1T:?:2; female, 0:7-11:(0)3-5(0):(1)4-6(1):5-9:5-8:5-7:3-8:5-8:T1T3-4T1T:?:2. Coxal chaetotaxy: male, 4-5:5:2-4:4-5; female, 4-6:4-6:3-5:3-5.

Dimensions (mm): Body length 2.0-2.3 (1.8-2.9); pedipalps: trochanter 0.275-0.33/0.155-0.18 (0.255-0.36/0.15-0.225), femur 0.46-0.545/0.165-0.21 (0.41-0.60/0.16-0.24), tibia 0.39-0.475/0.175-0.22 (0.36-0.51/0.16-0.26), chela (with pedicel) 0.715-0.815/0.20-0.24 (0.66-0.91/0.19-0.28), chela (without pedicel) 0.68-0.775 (0.63-0.87), moveable finger length 0.33-0.38 (0.315-0.42); chelicera 0.15-0.16/0.08-0.095 (0.135-0.19/0.08-0.11), moveable finger length 0.10-0.11 (0.095-0.13); carapace 0.67-0.80/0.45-0.52 (0.65-0.87/0.47-0.65); leg I: coxa 0.19-0.20/0.22-0.23 (0.185-0.25/0.20-0.29), trochanter 0.09-0.11/0.08-0.09 (0.08-0.13/0.07-0.11), femur I 0.10-0.11/0.095-0.105 (0.085-0.13/0.09-0.13), femur II 0.145-0.16/0.10-0.105 (0.13-0.19/0.09-0.13), tibia 0.17-0.19/0.065-0.07 (0.15-0.22/0.06-0.08), tarsus 0.07-0.095/0.045-0.05 (0.095-0.13/0.045-0.055); leg IV: coxa width 0.18-0.24 (0.19-0.27), trochanter 0.125-0.14/0.10-0.11 (0.125-0.17/0.09-0.125), femur I 0.15-0.19/0.165-0.175 (0.15-0.22/0.145-0.225), femur II 0.22-0.26/0.16-0.175 (0.21-0.32/0.145-0.225), tibia 0.275-0.31/0.09-0.105 (0.255-0.37/0.085-0.12), tarsus 0.16/0.06-0.07 (0.14-0.19/0.055-0.075).

TRITONYMPHS: Pedipalpal trochanter 1.33 to 1.83, femur 2.32 to 2.72, tibia 1.94 to 2.30, chela (with pedicel) 3.10 to 3.84, chela (without pedicel) 3.00 to 3.65 times longer than broad. Fixed finger with seven trichobothria, moveable finger with two trichobothria (Fig. 104); *it*, *sb* and *st* absent. Serrula exterior of chelicera with 10 to 11 lamellae. Galea as for female. Carapace with 21 to 23 setae; 1.41 to 1.55 times longer than broad. Tergal chaetotaxy: 4-6:4-5:4:5-6:5-6:6:6:6:6:T1T2T1T:?:2. Sternal chaetotaxy: 0:2:(0)4(0):(1)4(1):6:6:5-6:5-6:6:T1T2T1T:?:2. Coxal chaetotaxy: 3-5:4-5:3:3.

Dimensions (mm): Body length 1.5-2.2; pedipalps: trochanter 0.22-0.265/0.125-0.165, femur 0.34-0.36/0.135-0.165, tibia 0.305-0.36, chela (with pedicel) 0.59-0.72/0.155-0.195, chela (without pedicel) 0.56-0.685, moveable finger length 0.275-0.33; carapace 0.61-0.71/0.39-0.48.

DEUTONYMPH: Pedipalpal trochanter 1.40 to 1.71, femur 2.08 to 2.25, tibia 1.85 to 1.92, chela (with pedicel) 3.13, chela (without pedicel) 3.10 times longer than broad. Fixed finger with six trichobothria, moveable finger with two trichobothria (Fig. 105); *it*, *esb*, *sb* and *st* absent. Serrula exterior of chelicera with 9 lamellae. Galea as for female. Carapace with 16 setae; 1.43 times longer than broad. Tergal chaetotaxy: 4:4:4:5:4:4:4:4:4:T1T2T1T:?:2. Sternal chaetotaxy: 0:0:(0)4(0):(1)4(1):4:4:4:4:4:T1T4T1T:?:2. Coxal chaetotaxy: 3:3:2:2.

Dimensions (mm): Body length 1.5; pedipalps: trochanter 0.175-0.18/0.105-0.125, femur 0.27/0.12-0.13, tibia 0.24/0.125-0.13, chela (with pedicel) 0.485/0.155, chela (without pedicel) 0.48, moveable finger length 0.24; carapace 0.50/0.35.

PROTONYMPH: Although the single available protonymph is in poor condition, the following observations could be made. Pedipalpal trochanter 1.63, femur 2.67, tibia 1.94, chela (with pedicel) 3.50, chela (without pedicel) 3.45 times longer than broad. Fixed finger with three trichobothria, moveable finger with one trichobothrium (Fig. 106); *eb*, *et*, *ib* and *t* present. Serrula exterior of chelicera with 9 lamellae; seta *gs* absent. Carapace with 10 setae; 1.23 times longer than broad.

Dimensions (mm): Pedipalps: trochanter 0.13/0.08, femur 0.20/0.075, tibia 0.165/0.085, chela (with pedicel) 0.385/0.11, chela (without pedicel) 0.38, moveable finger length 0.20; carapace 0.38/0.31.

Habitat.—This species has been taken from under bark of *Eucalyptus* spp., *Melaleuca* sp. and *Gyrocarpus americanus*.

Remarks.—*Afrosterphorus hirsti* is a widely distributed species which is easily recognized by the form of the male genitalia.

I (Harvey 1982) recorded the presence of a nematode (Mermithidae) from a female (MH302.51) which was collected near Tenterfield, N.S.W.

Other specimens examined.—**AUSTRALIA:** NEW SOUTH WALES; 32 km SW of Forbes, under bark of *Eucalyptus* sp., 6 May 1981 (M. S. Harvey and M. Kotzman), 1 male (AM, KS 8365, MH 295.01) (spirit). 3 km E of Tabulam 28°53'S 152°34'E, under bark of *E.* sp., 23 November 1983 (M. S. Harvey and D. C. F. Rentz), 3 males, 1 tritonymph (ANIC, MH536.01-04) (spirit). 53 km W of Tenterfield, under bark of *E.* sp., 13 May 1981 (M. S. Harvey and M. Kotzman), 13 males, 9 females, 2 tritonymphs, 1 deutonymph (MV, MH302.29-32, 35-45, 48-57) (slides and spirit). Same data as above, 5 males, 5 females (AM, KS 8366, MH302.01-10) (slides and spirit). Same data as above, 5 males, 5 females (QM, S994-1003, MH302.11-20) (slides and spirit). Same data as above, 2 males, 2 females (ANIC, MH302.21-24) (slides). Same data as above, 2 males, 2 females (VAM, MH302.33-34, 46-47) (spirit). Same data as above, 2 males, 2 females (MHNG, MH302.25-28) (spirit). 13 km SW of Texas, under bark of *E.* sp., 1 June 1980 (C. Silveira), 1 female (AM, KS 8364, MH218.01) (slide). 16 km S of Texas, 29°00'S 151°09'E, under bark of *E.* sp., 24 November 1983 (D. C. F. Rentz and M. S. Harvey), 19 males, 17 females, 1 tritonymph (ANIC, MH538.05-41) (spirit). 19 km SSW of Texas, 29°00'S 151°05'E, under bark of *E.* sp., 24 November 1983 (D. C. F. Rentz and M. S. Harvey), 2 females, 1 tritonymph (ANIC, MH539.01-03) (spirit). 20 km SW of Texas, under bark of *E.* sp., 18 May 1980 (C. Silveira), 2 females (MV, MH210.03-04) (slides): QUEENSLAND; 6 km E of Chillagoe, under bark of *Melaleuca* sp., 10 December 1980 (M. Kotzman), 1 female, 1 tritonymph (MV, MH 268.01-02) (slides). Chillagoe, under bark of *E.* sp., 13 December 1980 (M. Kotzman), 3 females (QM, S988-990, MH270.01-03) (slides). 3 km W of Chillagoe, under bark of *E.* sp., 14 December 1980 (M. Kotzman), 1 female (QM, S991, MH271.01) (slide). 3 km S of Chillagoe, under bark of *E.* sp., 17 December 1980 (M. Kotzman), 1 male (QM, S992, MH272.01) (slide). 10 km NNE of Condamine, under bark of *E.* sp., 28 August 1980 (M. S. Harvey), 1 male, 2 females, 3 tritonymphs, 1 protonymph (QM, S980-986, MH273.01-07) (slides). Davies Creek National Park, 39 km E of Mareeba, under bark of *E.* sp., 23 August 1981 (N. and S. Wentworth), 1 female (QM, S1004, MH345.01) (spirit). Dome Rock, near Chillagoe, under bark of *Gyrocarpus americanus*, 31 December 1982 (M. Kotzman), 5 males, 8 females (ANIC, MH474.06-18) (spirit and points). 14 km N of Mt. Isa, under bark of *E.* sp., 22 August 1980 (M. S. Harvey), 1 female (QM, S979, MH234.06) (slide). 2 km S of Rookwood Homestead, near Chillagoe, under bark of *M.* sp., 12 December 1980 (M. Kotzman), 1 female (QM, S987, MH269.02) (slide). 68 km WSW of Warwick, under bark of *E.* sp., 7 May 1981 (M. S. Harvey and M. Kotzman), 1 female (QM, S993, MH296.01) (spirit).

Afrosterphorus nanus, new species

Figs. 57, 72, 109-113, 129; Map 5

Types.—Holotype male, three paratypes males, paratype female, paratype female?, two paratype tritonymphs, Rum Jungle, Northern Territory, Australia, under bark of *Eucalyptus* sp., 13 August 1980 (M. S. Harvey), NTM, A1-A8, MH230.01-04, 09-12 (slides).

Two paratypes males, same data as above, MV, K054-K055, MH230.07-08 (slides). Two paratype males, same data as above, ANIC, MH230.05-06 (slides).

Etymology.—The specific epithet refers to the small size of this species (*nanus* L. a dwarf).

Distribution.—Northern Territory, Australia (Map 5).

Diagnosis.—Male genitalia with long, tapering dorsal apodemes. Female galea with three distal and one subbasal rami. Small species: chela (with pedicel) 0.55 to 0.59 (male), 0.56 to 0.61 mm (female) in length.

Description.—ADULTS: Pedipalpal trochanter 1.57 to 1.91 (male), 1.75 to 1.84 (female), femur stout 2.35 to 2.57 (male), 2.40 to 2.62 (female), tibia 1.97 to 2.21 (male), 1.94 to 2.07 (female), chela (with pedicel) 2.95 to 3.47 (male), 3.03 to 3.22 (female), chela (without pedicel) 2.82 to 3.32 (male), 2.89 to 3.05 (female) times longer than broad. Trichobothria as for *aethiopicus* group, in usual position (Figs. 109-110). Serrula exterior of chelicera with 11 (male, female) lamellae. Galea of male simple, of female with three distal and one subbasal rami (Fig. 72). Carapace (Fig. 112) unconstricted, with 20 to 24 (male), 21 (female) setae; 1.33 to 1.56 (male), 1.36 to 1.81 (female) times longer than broad. Male genitalia (Fig. 57) with long, tapering dorsal apodemes which are often difficult to observe. Female genitalia as for genus (Fig. 113).



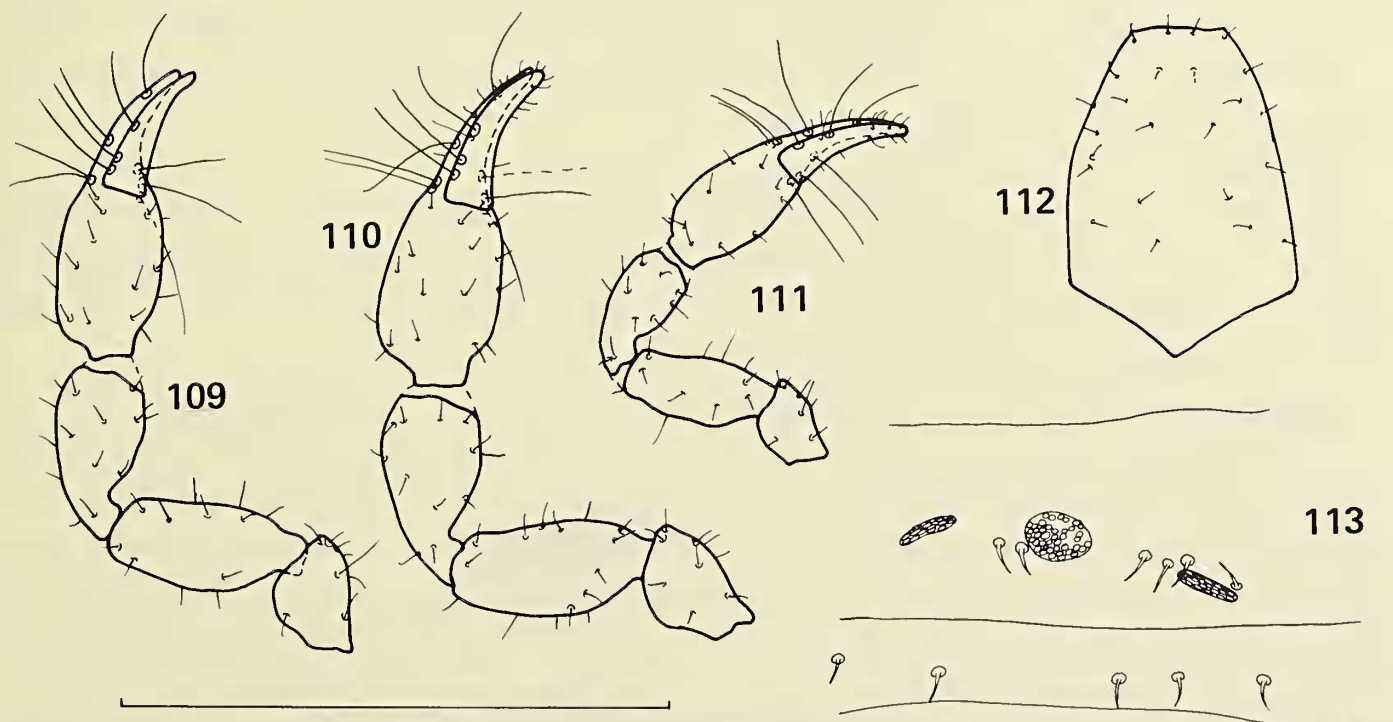
Map. 5.—Australia showing known distribution of *Afrosterphorus hirsti* (Chamberlin) (circles), *A. nanus*, new species (squares), *A. anabates*, new species (triangles) and *A. xalyx*, new species (star).

Tergal chaetotaxy: male, 4-6:3-6:3-6:4:4-5:3-5:4-6:4-7:4-7:T1T2-4T1T:?:2; female, 5:5:4:4:?:?:?:?:?:?:2. Sternal chaetotaxy: male, 0:6-7:(0)4[6-8](0):(1)4-5(1):4-5:4-6:4-6:4-6:4-7:T1T2-4T1T:?:2; female, 0:7:(0)4(0):(1)4(1):?:?:?:?:?:?:2. Coxal chaetotaxy: male, 3-6:4-6:3-5:4; female, 4-5:4-5:4-5:4.

Dimensions (mm): Body length 1.6-1.7 (?); pedipalps: trochanter 0.21-0.23/0.11-0.14 (0.21-0.23/0.12-0.125), femur 0.345-0.385/0.135-0.155 (0.36-0.38/0.145-0.155), tibia 0.295-0.33/0.14-0.16 (0.31-0.34/0.15-0.165), chela (with pedicel) 0.55-0.59/0.165-0.19 (0.56-0.61/0.18-0.19), chela (without pedicel) 0.515-0.565 (0.535-0.58), moveable finger length 0.26-0.285 (0.27-0.29); chelicera 0.12-0.13/0.065-0.085 (0.13-0.135/0.08), moveable finger length 0.07-0.09 (0.09); carapace 0.53-0.57/0.36-0.40 (0.56-0.61/0.31-0.45); leg I: coxa 0.15-0.18/0.17-0.18 (0.16/0.19), trochanter 0.075-0.08/0.065-0.07 (0.08-0.11/0.065-0.075), femur I 0.07-0.08/0.08-0.09 (0.085-0.10/0.075-0.10), femur II 0.11-0.12/0.08-0.09 (0.105-0.13/0.075-0.10), tibia 0.135-0.15/0.055-0.065 (0.14-0.15/0.06-0.105), tarsus 0.07-0.09/0.035-0.045; leg IV: coxa width 0.17-0.19 (?), trochanter 0.105-0.11/0.075-0.085 (0.11-0.13/0.085-0.095), femur I 0.13-0.14/0.125-0.145 (0.145-0.15/0.14-0.16), femur II 0.16-0.19/0.13-0.145 (0.18-0.20/0.145-0.16), tibia 0.215-0.23/0.075-0.085 (0.22-0.245/0.085-0.10), tarsus 0.12-0.125/0.05 (0.115-0.15/0.055-0.075).

TRITONYMPHS: Pedipalpal trochanter 1.60 to 1.70, femur 2.29 to 2.64, tibia 2.00 to 2.19, chela (with pedicel) 3.15 to 4.07, chela (without pedicel) 3.05 to 3.93 times longer than broad. Fixed finger with seven trichobothria, moveable finger with two trichobothria (Fig. 111); *it*, *sb* and *st* absent. Serrula exterior of chelicera with 10 to 11 lamellae. Galea as for female. Carapace unconstricted, with 18 to 22 setae; 1.38 times longer than broad. Tergal chaetotaxy: 4-5:4:3-4:3-6:5:6:5:5:6:T1T2T1T:?:2. Sternal chaetotaxy: 0:2:(0)4(0):(1)3(1):6:6:6:6:6:T1T2T1T:?:2. Coxal chaetotaxy: 3-4:4:2-4:3-4.

Dimensions (mm): Body length 1.5; pedipalps: trochanter 0.16-0.24/0.10-0.15, femur 0.28-0.39/0.11-0.17, tibia 0.23-0.36/0.115-0.175, chela (with pedicel) 0.59-0.65/0.145-0.205, chela (without pedicel) 0.57-0.625, moveable finger length 0.235-0.31; carapace 0.62/0.45.



Figs. 109-113.—*Afrosternophorus nanus*, new species: 109, ventral aspect of right pedipalp, male holotype; 110, same, female paratype, MH230.09; 111, same, tritonymph paratype, MH230.12; 112, dorsal aspect of carapace, male holotype; 113, female genitalia and associated sternites, paratype, MH230.09. Scale line = 1.00 (Figs. 109-112), 0.25 mm (Fig. 113).

Habitat.—The types were collected together under the bark of a single tree (*Eucalyptus* sp.). The Roper Bar tritonymph was collected from under the bark of a tree.

Remarks.—This species is easily distinguished from all other species of the genus by its small size and the form of the male genitalia. It appears to be most similar to *A. grayi*, but the two are separable on size (Fig. 129). The “paratype female?” referred to above is in poor condition and its gender is difficult to ascertain. It possesses an adult trichobothrial pattern, but due to the contorted and shrivelled state of the abdomen, the presence of cribriform plates cannot be confirmed. The tritonymph from Roper Bar has not been designated as a type specimen because it is slightly larger than tritonymphs of the type series. Nevertheless, it is believed to be a member of this species, but adult material is needed to confirm this record.

Other specimens examined.—AUSTRALIA: NORTHERN TERRITORY; 13.5 km SE of Roper Bar, under bark of tree, 17 July 1980 (C. Silveira), 1 tritonymph (NTM, MH222.04) (slide).

Afrosterophorus anabates, new species

Figs. 8, 58, 73, 114-120, 129; Map 5

Types.—Holotype male, one paratype male, three paratype females, one paratype tritonymph, 15 km WNW of Yaapect, Lake Albacutya Park, Victoria, Australia, under bark of *Eucalyptus camaldulensis*, 2 July 1982 (M. S. Harvey and B. E. Roberts), MV, K125-K129, K145, MH416.05-06, 11-14 (slides and spirit). Two paratype males, two paratype females, same data as above, ANIC, MH416.07-10 (slides). Paratype male, paratype female, paratype protonymph, same data as above except 3 July 1982, MV, K130-132, MH419.03-05 (slides). Paratype male, paratype tritonymph, Mt. Killawarra, 17 km NW of Wangaratta, Victoria, Australia, ex *Delena cancerides* Walckenaer (Sparassidae: Araneae), 7 November 1978 (M. S. Harvey), MV K053-053a, MH044.01-02 (slides). Two paratype females, Reedy Lake, near Nagambie, Victoria, Australia, ex *D. cancerides* or *Isopoda* sp. (Sparassidae), 23 November 1979 (H. E. Parnaby), MV, K050-051, MH151.01-02 (slides). Paratype female, 6.5 km SSW of Stuart Mill, Victoria, Australia, ex *D. cancerides*, 3 December 1977 (M. S. Harvey), MV, K052, MH004.01 (slide).

Etymology.—The specific epithet refers to the phoretic habit exhibited by some of the specimens (*anabates* Gr. rider, passenger).

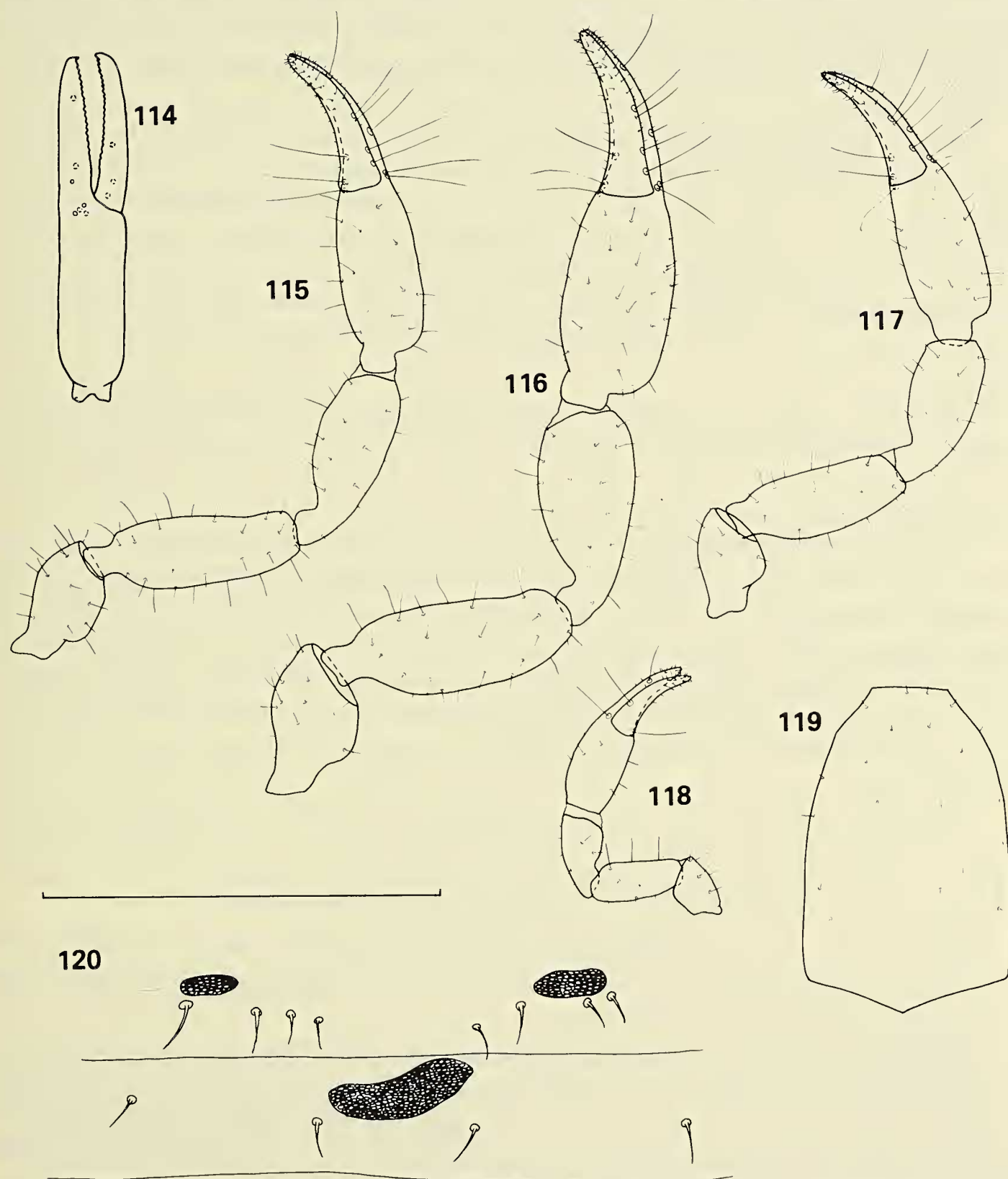
Distribution.—Victoria, Australia (Map 5).

Diagnosis.—Male genitalia with anterior apodeme distally broad; lateral apodemes elongate, tapering. Female galea with three distal, one subdistal and two (sometimes one) basal to subbasal rami. Chela (with pedicel) 0.83 to 0.895 (male), 0.835 to 1.03 mm (female) in length. Sometimes phoretic on huntsman spiders.

Description.—ADULTS: Pedipalpal trochanter 1.71 to 1.89 (male), 1.51 to 1.90 (female), femur elongate, 2.77 to 3.08 (male), 2.43 to 3.13 (female), tibia 2.31 to 2.59 (male), 2.04 to 2.52 (female), chela (with pedicel) 3.56 to 4.15 (male), 3.38 to 4.00 (female), chela (without pedicel) 3.38 to 3.90 (male), 3.27 to 3.79 (female) times longer than broad. Trichobothria as for *aethiopicus* group, in usual position (Figs. 114-116). Serrula exterior of chelicera with 11 to 13 (male), 11 to 12 (female) lamellae. Galea of male simple, of female with three distal, one subdistal and two (sometimes one) basal to subbasal rami (Fig. 73). Carapace usually unconstricted (Fig. 119), but occasionally a slight constriction is apparent; with 16 to 23 (male), 18 to 27 (female) setae; 1.46 to 1.59 (male), 1.38 to 1.55 (female) times longer than broad. Male genitalia (Fig. 58) with anterior apodeme distally broad, lateral apodemes long and tapering. Female genitalia as

for genus (Fig. 120). Tergal chaetotaxy: male, 6:5-7:4:5-8:6-7:6:6-7:6:6:T1T3-4T1T:?:2; female, 5-7:5-6:3-4:4-6:4-7:4-7:6-7:5-7:6-7:T1T4-5T1T:?:2. Sternal chaetotaxy: male, 0:4-8:(0)4-5[6-8](0):(1)5-6(1):6-8:5-7:6-7:6-8:6:T1T3-4T1T:?:2; female, 0:6-8:(0)4-5(0):(1)2-6(1):6-8:6-9:6-8:6-7:6-7:T1T4T1T:?:2. Coxal chaetotaxy: male, 3-5:4-6:4-5:3-5; female, 3-6:3-7:3-5:3-5.

Dimensions (mm): Body length 2.2-2.5 (2.4-3.4); pedipalps: trochanter 0.325-0.375/0.175-0.205 (0.335-0.40/0.175-0.245), femur 0.55-0.595/0.175-0.215 (0.52-0.695/0.19-0.235), tibia 0.475-0.525/0.185-0.225 (0.465-0.60/0.195-0.27), chela (with pedicel)



Figs. 114-120.—*Afrosternophorus anabates*, new species: 114, lateral aspect of left chela, male paratype, MH044.01; 115, ventral aspect of left pedipalp, male holotype; 116, same, female paratype, MH416.09; 117, same, tritonymph paratype, MH416.14; 118, ventral aspect of right pedipalp, protonymph paratype, MH419.05; 119, dorsal aspect of carapace, male holotype; 120, female genitalia and associated sternites, paratype, MH416.09. Scale line = 1.00 mm (Figs. 114-119), 0.25 mm (Fig. 120).

0.83-0.895/0.205-0.25 (0.835-1.03/0.21-0.28), chela (without pedicel) 0.795-0.855 (0.795-0.98), moveable finger length 0.39-0.425 (0.40-0.475); chelicera 0.16-0.185/0.095-0.10 (0.165-0.20/0.10-0.11), moveable finger length 0.11-0.125 (0.12-0.14); carapace 0.82-0.89/0.52-0.59 (0.83-1.005/0.555-0.695); leg I: coxa 0.21-0.24/0.24-0.265 (0.23-0.29/0.26-0.30), trochanter 0.12-0.13/0.08-0.10 (0.12-0.15/0.095-0.12), femur I 0.11-0.13/0.11-0.13 (0.12-0.145/0.115-0.15), femur II 0.175-0.195/0.115-0.135 (0.18-0.22/0.12-0.155), tibia 0.20-0.225/0.07-0.085 (0.21-0.255/0.075-0.09), tarsus 0.11-0.13/0.05-0.055 (0.12-0.13/0.05-0.06); leg IV: coxa width 0.22-0.24 (0.26-0.29), trochanter 0.155-0.16/0.105-0.12 (0.16-0.19/0.115-0.135), femur I 0.205-0.22/0.175-0.225 (0.215-0.27/0.20-0.26), femur II 0.285-0.33/0.185-0.235 (0.30-0.37/0.205-0.26), tibia 0.34-0.375/0.11-0.135 (0.35-0.43/0.115-0.14), tarsus 0.16-0.19/0.07-0.085 (0.18-0.21/0.07-0.09).

TRITONYMPHS: Pedipalpal trochanter 1.51 to 1.81, femur 2.38 to 2.73, tibia 2.08 to 2.29, chela (with pedicel) 3.44 to 3.85, chela (without pedicel) 3.30 to 3.69 times longer than broad. Fixed finger with seven trichobothria, moveable finger with two trichobothria (Fig. 117); *it*, *sb* and *st* absent. Serrula exterior of chelicera with 11 lamellae. Galea with three distal to subdistal and two subbasal rami. Carapace with 17 setae; 1.46 to 1.53 times longer than broad. Tergal chaetotaxy: 6-7:4-5:4:4-5:4-5:4-6:5-6:5-7:5-6:T1T2T1T:?:2. Sternal chaetotaxy: 0:2:(0)4(0):(1)4-5(1):6:5-6:6-7:6:6:T1T2T1T:?:2. Coxal chaetotaxy: 3-4:3-4:3:3.

Dimensions (mm): Body length 2.3-2.5; pedipalps: trochanter 0.265-0.28/0.155-0.175, femur 0.44-0.46/0.165-0.185, tibia 0.375-0.39/0.17-0.18, chela (with pedicel) 0.735-0.75/0.195-0.215, chela (without pedicel) 0.705-0.725, moveable finger length 0.345-0.36; carapace 0.70-0.75/0.48-0.49.

PROTONYMPHS: Pedipalpal trochanter 1.68 to 1.78, femur 2.53 to 2.61, tibia 1.95 to 2.05, chela (with pedicel) 3.60 to 3.71, chela (without pedicel) 3.52 to 3.54 times longer than broad. Fixed finger with three trichobothria, moveable finger with one trichobothrium (Fig. 118); *eb*, *et*, *ib* and *t* present. Serrula exterior of chelicera with 9 to 10 lamellae. Setae absent. Galea with three distal to subdistal rami. Carapace with 14 setae; 1.26 times longer than broad. Tergal chaetotaxy: 4:2:0:4:4:4:4:4:4:TTTT:TTTT:2. Sternal chaetotaxy: 0:0:(0)2(0):(1)2(1):4:4:4:4:4:TTTT:TT:2. Coxal chaetotaxy: 1:1:1:1.

Dimensions (mm): Body length 1.5; pedipalps: trochanter 0.16/0.09-0.095, femur 0.235-0.24/0.09-0.095, tibia 0.205/0.10-0.105, chela (with pedicel) 0.445-0.45/0.12-0.125, chela (without pedicel) 0.425-0.44, moveable finger length 0.22-0.23; carapace 0.48/0.38.

Habitat.—As discussed in detail below, some specimens were taken from spiders of the family Sparassidae (*Delena cancerides* and *Isopoda* sp.), whereas others were taken from under bark of *Eucalyptus camaldulensis*.

Remarks.—This species is easily distinguished from other members of the genus except *A. papuanus* by the shape of the male genitalia (distally broad anterior apodeme) and the form of the female galea. It differs from *A. papuanus* only in size; *papuanus* is smaller than *anabates*. It is thought that these two species are sister-species because they possess a synapomorphy in the form of the anterior apodeme.

Three of the five known collections of *A. anabates* have been taken from sparassid spiders. The Mt. Killawarra specimens were found clinging to leg setae of a male of *D. cancerides* which was found under bark of *Eucalyptus melliodora*. The Reedy Lake material was removed from a vial containing specimens of *D. cancerides* and *Isopoda* sp.

which were collected under bark of *Eucalyptus* sp. Since the sternophorids were not collected from the bark of the tree (H. E. Parnaby, pers. comm.), they were obviously phoretic on one or both of the spider species. The Stuart Mill specimen was taken from a leg seta of a male of *D. cancerides* which was found under bark of a log. Extensive collecting at Stuart Mill and Mt. Killawarra failed to disclose any further sternophorids, even though many corticolous species of the families Atemnidae, Chernetidae and Cheliferidae were found. Conversely, at Lake Albacutya, *A. anabates* was only found under bark of *E. camaldulensis* and was not found on any sparassids that also occurred in the area (*D. cancerides*, *Isopoda* spp.). It is of interest to note that the phoretic nature of this species may be seasonal. It has been collected from spiders in November and December, and it has been found under bark in July. Naturally, much more collecting is needed before any definite statements may be made. It would be very interesting to examine this aspect of the pseudoscorpion's biology in relation to the time of year that mating and egg production takes place. Unfortunately, no such data is available for *A. anabates*, or, for that matter, any other sternophorid species.

The only other pseudoscorpion species that is known to be phoretic on a spider is the chernetid *Lustrochernes grossus* (Banks) from southern U.S.A. (Hoff and Jennings 1974). The spider from which it was taken was also a sparassid (= Heteropodidae; Platnick and Levi 1973), *Olios fasciculatus* Simon. In contrast to *A. anabates*, *L. grossus* has been found in a variety of habitats, including the bark of trees and under the elytra of cerambycid beetles (Hoff and Jennings 1974, Benedict and Malcolm 1982). Dr. Jennings (pers. comm.) kindly informed me that no further records of *L. grossus* on *O. fasciculatus* have been detected.

Hoff and Jennings suggested that the aggressive nature of spiders accounted for the lack of phoretic pseudoscorpions. The two specimens of *L. grossus* that Hoff and Jennings examined were found clinging to "dorsal abdominal setae", where, they suggest, the spider could not reach, and hence, dislodge and eat the pseudoscorpions. *Afrosterphorus anabates* has been taken from leg setae, a position which would be easily accessible to cleaning. Mites also are not uncommon on sparassids, which suggests that they do not clean themselves as rigorously as Hoff and Jennings imply. Heavily infested specimens are often in poor physical condition, yet it cannot be ascertained whether the mites are responsible for this state, or whether they are attracted to, or reproduce vigorously on weak specimens.

Afrosterphorus papuanus (Beier), new combination

Figs. 59, 74, 121-124, 129; Map 6

Sternophorus papuanus Beier 1974:211-212, Fig. 5.

Types.—Lectotype male (present designation), paralectotype male, two paralectotype females, Americ, Madang District, Papua New Guinea, 1972 (B. Gray), NHMW (spirit).

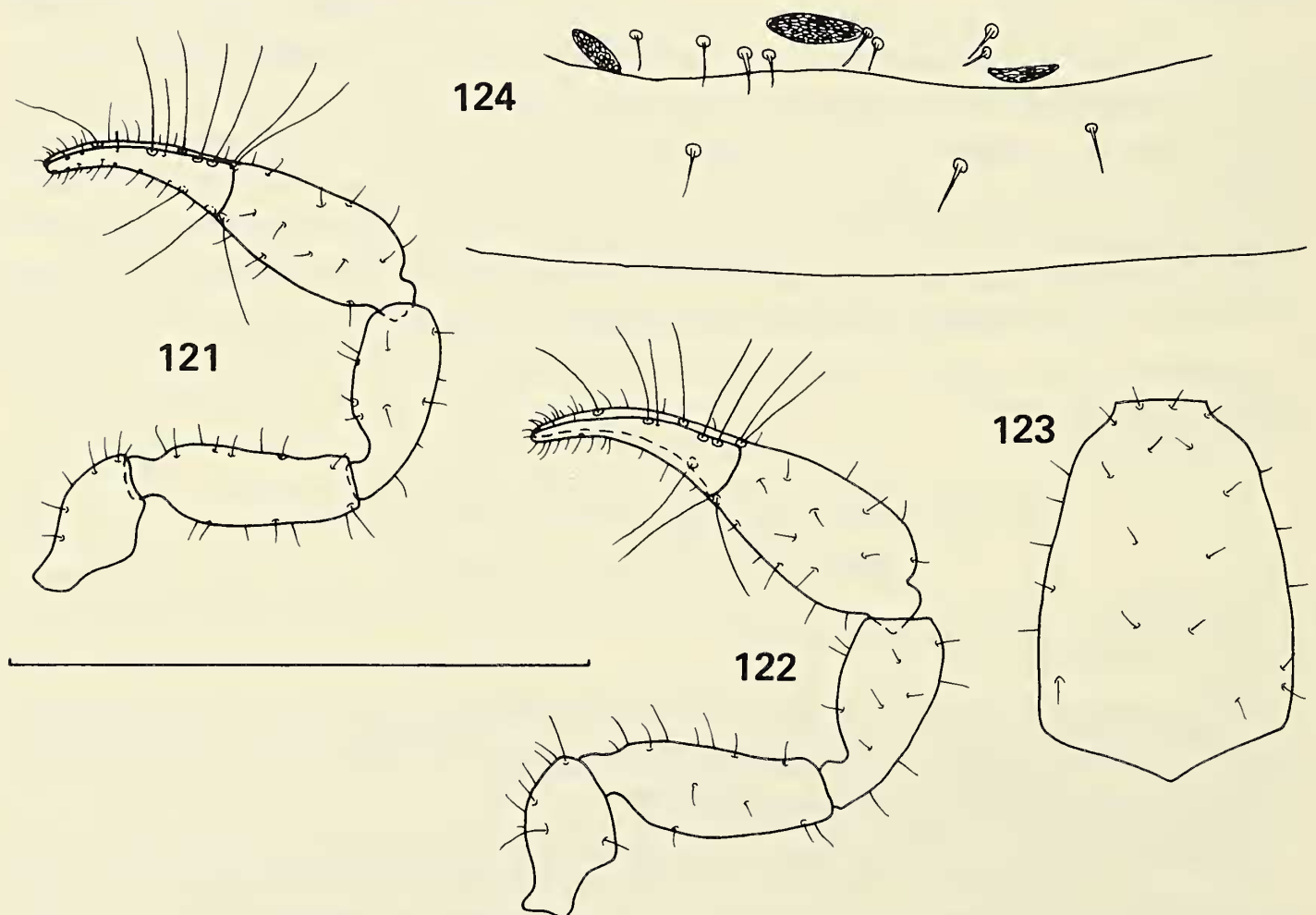
Distribution.—Papua New Guinea (Map 6).

Diagnosis.—Male genitalia with anterior apodeme distally broad; lateral apodemes long and tapering. Female galea with three distal, one subdistal and two subbasal rami. Chela (with pedicel) 0.61 to 0.69 (male), 0.73 to 0.74 mm (female) in length.

Description.—Pedipalpal trochanter 1.82 to 1.89 (male), 1.83 to 1.87 (female), femur 3.00 to 3.19 (male), 2.87 to 2.93 (female), tibia 2.38 to 2.57 (male), 2.12 to 2.32 (female), chela (with pedicel) 3.97 to 4.18 (male), 3.65 to 3.79 (female), chela (without

pedicel) 3.73 to 4.20 (male), 3.45 to 3.56 (female) times longer than broad. Trichobothria as for *aethiopicus* group, in usual position (Figs. 121-122). Serrula exterior of chelicera with 11 (male), 12 (female) lamellae. Galea of male simple, of female with three distal, one subdistal and two subbasal rami (Fig. 74). Carapace (Fig. 123) unconstricted, with 24 (male, female) setae; 1.45 (male), 1.51 to 1.52 (female) times longer than broad. Male genitalia (Fig. 59) with distally broad anterior apodeme; lateral apodemes long and tapering. Female genitalia as for genus (Fig. 124). Tergal chaetotaxy: male, 6:5:2:4:5:6:6:6:6:T1T4T1T:?:2; female, 6:6:2:4:5-6:5-6:5-6:6:6:T1T3-4T1T:?:2. Sternal chaetotaxy: male, 0:6:(0)4[6](0):(1)5(1):?:?:6:6:T1T4T1T:?:2; female, 0:8-9:(0)4(0):(1)4(1):6-7:6:6:6:6-7:T1T4T1T:?:2. Coxal chaetotaxy: male, 3:2-4:3:3; female, 2-4:2-4:3:3-4.

Dimensions (mm): Body length 1.7-2.0 (2.3-2.5); pedipalps: trochanter 0.255-0.265/0.14 (0.275-0.285/0.15-0.155), femur 0.405-0.42/0.135 (0.425-0.445/0.145-0.155), tibia 0.345-0.36/0.14-0.145 (0.35-0.36/0.155-0.165), chela (with pedicel) 0.655-0.69/0.165-0.17 (0.73-0.74/0.195-0.20), chela (without pedicel) 0.61-0.645 (0.69-0.695), moveable finger length 0.30-0.335 (0.375-0.385); chelicera 0.125-0.13/0.08-0.085 (0.13-0.135/0.08-0.09), moveable finger length 0.085-0.095 (0.10-0.105); carapace 0.64/0.44 (0.68-0.70/0.45-0.46); leg I: coxa ?? (0.195-0.20/0.225-0.23), trochanter 0.095/0.07 (0.10/0.075), femur I 0.10/0.09 (0.095/0.085-0.095), femur II 0.10/0.09 (0.15-0.155/0.085-0.095), tibia 0.16/0.055 (0.16/0.06), tarsus 0.10/0.035 (0.11/0.045); leg IV: coxa width 0.17 (0.23), trochanter 0.135/0.085 (0.14/0.095), femur I 0.18/0.125 (0.18/0.145), femur II 0.21/0.13 (0.23/0.15), tibia 0.23/0.085 (0.255/0.09), tarsus 0.12/0.06 (0.12/0.055).



Figs. 121-124.—*Afrosternophorus papuanus* (Beier): 121, ventral aspect of left pedipalp, male lectotype; 122, same, female paralectotype; 123, dorsal aspect of carapace, male lectotype; 124, female genitalia and associated sternites, paralectotype. Scale line = 1.00 mm (Figs. 121-123), 0.25 mm (Fig. 124).



Map 6.—Papua New Guinea and Irian Jaya showing known distribution of *Afrosternophorus papuanus* (Beier) (circle) (district record only), *A. grayi* (Beier) (squares), *A. araucariae* (Beier) (triangle) and *A. cavernae* (Beier) (star). Open symbol represents literature record only.

Habitat.—No habitat data accompanied the specimens.

Remarks.—*Afrosternophorus papuanus* is easily separated from its congeners, except *A. anabates*, by the form of the male genitalia (distally broad anterior apodeme) and the female galea. It can be distinguished from *A. anabates* only by its smaller size (Fig. 129). These two species are thought to be sister-species because both possess the distally broad anterior apodeme, which is a synapomorphy.

The locality of “Americ” cannot be traced, and the map shows the district (Madang) record only.

Beier (1974) recorded the type material as “Type und Paratypen: 2 ♂, 2 ♀”, yet failed to distinguish a holotype in the collection. Therefore, a male lectotype has been herein selected.

Afrosternophorus grayi (Beier), new status, new combination

Figs. 60, 75, 125-129; Map 6

Sternophorus hirsti grayi Beier 1971:370-371, Fig. 2.

Types.—Lectotype male (present designation), six paralectotype males, five paralectotype females, Bulolo, Morobe District, Papua New Guinea, 18 August 1970 (B. Gray), NHMW (spirit). Two paralectotype females, Bunu, Lake Kutubu, Southern Highlands District, Papua New Guinea, 22 November 1969 (B. Gray), NHMW (spirit).

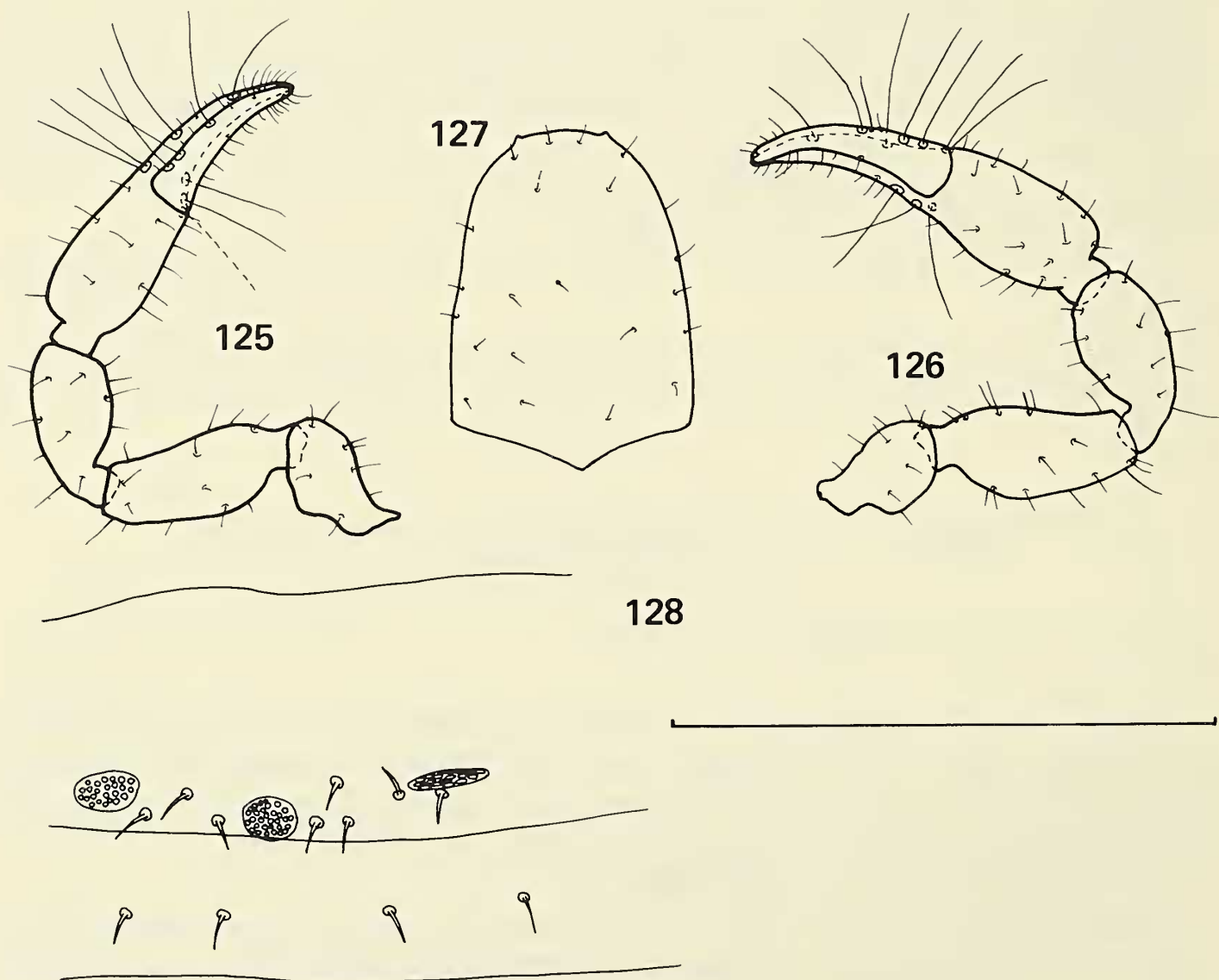
Distribution.—Papua New Guinea (Map 6).

Diagnosis.—Male genitalia with long, acute dorsal apodemes. Female galea with two distal, one subdistal and one subbasal rami. Chela (with pedicel) 0.645 to 0.70 (male), 0.68 to 0.74 mm (female) in length.

Description.—Pedipalpal trochanter 1.68 to 1.86 (male), 1.66 to 1.86 (female), femur stout, 2.30 to 2.65 (male), 2.21 to 2.58 (female), tibia 2.03 to 2.29 (male), 1.92 to 2.23 (female), chela (with pedicel) 3.42 to 3.94 (male), 2.96 to 3.94 (female), chela (without pedicel) 3.21 to 3.51 (male), 2.70 to 3.75 (female) times longer than broad. Trichobo-

thria as for *aethiopicus* group, in usual position (Figs. 125-126). Serrula exterior of chelicera with 12 (male), 11 to 13 (female) lamellae. Galea of male simple, of female with two distal, one subdistal and one subbasal rami (Fig. 75). Carapace (Fig. 127) unconstricted, with 21 to 23 (male), 19 to 24 (female) setae; 1.40 to 1.51 (male), 1.09 to 1.39 (female) times longer than broad. Male genitalia (Fig. 60) obscure, slightly distorted; dorsal apodemes long and tapering. Female genitalia as for genus (Fig. 128). Tergal chaetotaxy: male, 6:5-6:2-3:4-5:4-5:5:5-6:5-6:6:T1T2?-4T1T?:?2; female, 5-6:5-7:1-4:4-6:3?-6:4-6:5-6:5-6:5-6:T1T2?-3T1T?:?2. Sternal chaetotaxy: male, 0:3-6:(0)4-6[5-6](0):(1)4(1):4-6:5-6:3?-6:5-6:5-6:T1T2-4T1T?:?2; female, 0:6-10:(0)4-6(0):(1)4-5(1):6:5-6:4-6:5-6:5-6:T1T2-4T1T?:?2. Coxal chaetotaxy: male, 3-6:3-5:3-5:3-5; female, 3-5:3-5:3-4:4-5.

Dimensions (mm): Body length 1.4-2.1 (1.8-2.7); pedipalps: trochanter 0.235-0.27/0.135-0.155 (0.24-0.295/0.14-0.165), femur 0.385-0.445/0.155-0.185 (0.39-0.465/0.165-0.195), tibia 0.32-0.37/0.14-0.175 (0.33-0.39/0.155-0.195), chela (with pedicel) 0.645-0.70/0.17-0.195 (0.68-0.74/0.18-0.23), chela (without pedicel) 0.61-0.66 (0.62-0.70), moveable finger length 0.315-0.36 (0.325-0.38); chelicera 0.145-0.16/0.08-0.085 (0.14-0.165/0.08-0.10), moveable finger length 0.10-0.11 (0.09-0.115); carapace 0.65-0.68/0.43-0.47 (0.645-0.72/0.49-0.59); leg I: coxa 0.18-0.19/0.20-0.21 (0.185-0.21/0.205-0.25), trochanter 0.095-0.11/0.07-0.085 (0.10-0.115/0.075-0.08), femur I 0.095-



Figs. 125-128.—*Afrosternophorus grayi* (Beier): 125, ventral aspect of right pedipalp, male lectotype; 126, ventral aspect of left pedipalp, female paralectotype from Bulolo, Papua New Guinea; 127, dorsal aspect of carapace, male lectotype; 128, female genitalia and associated sternites, paralectotype from Bulolo. Scale line = 1.00 mm (Figs. 125-127), 0.25 mm (Fig. 128).

0.11/0.085-0.11 (0.10-0.115/0.095-0.105), femur II 0.14-0.155/0.085-0.11 (0.14-0.16/0.095-0.105), tibia 0.16-0.165/0.07-0.075 (0.145-0.185/0.065-0.075), tarsus 0.09-0.10/0.045 (0.09-0.125/0.045-0.055); leg IV: coxa width 0.18-0.23 (0.215-0.22), trochanter 0.125-0.15/0.09-0.10 (0.14-0.155/0.09-0.115), femur I 0.165-0.175/0.155-0.18 (0.16-0.185/0.14-0.175), femur II 0.215-0.23/0.165-0.18 (0.215-0.25/0.14-0.18), tibia 0.255-0.27/0.095-0.105 (0.265-0.29/0.09-0.115), tarsus 0.135-0.14/0.065-0.07 (0.11-0.155/0.055-0.07).

Habitat.—This species has been taken from under bark of *Araucaria cunninghamii* and *A. hunsteinii* (Beier 1971), a fact which is not stated on the locality labels.

Remarks.—This species was originally described from many specimens, most of which were apparently returned to Dr. B. Gray, Entomology Section, Department of Forests, Bulolo, Papua New Guinea; despite repeated requests to this institution concerning the remaining material, it has not been available for study.

Beier labelled the Bunu specimens "Typen" and failed to designate a holotype. Furthermore, he stated in the original description that one male and one female were present in the vial. Both specimens are in fact females, and since it appears advantageous that the primary type be a male, a male lectotype has been selected from the Bulolo vial.

Beier also labelled the Bunu specimens as "*Sternophorus grayi* n. sp.", and the Bulolo specimens as "*Sternophorus hirsti grayi* n. sp.", even though he published the description under the latter combination.

As can be seen from the description, *A. grayi* is substantially different from *A. hirsti*, and Beier's decision to relegate it to subspecific rank cannot be justified. *Afrosterphorus grayi* appears to be most closely related to the Australian species *A. nanus*, from which it can be distinguished only by its larger size.

Araucariae group

Diagnosis.—As for genus, except that the moveable chelal finger possesses two trichobothria, *b* and *t*.

Subordinate taxa.—*Afrosterphorus araucariae* (Beier), *A. cavernae* (Beier), *A. fallax*, new species, *A. xalyx*, new species.

Afrosterphorus araucariae (Beier), new combination

Figs. 61, 130-132; Map 6

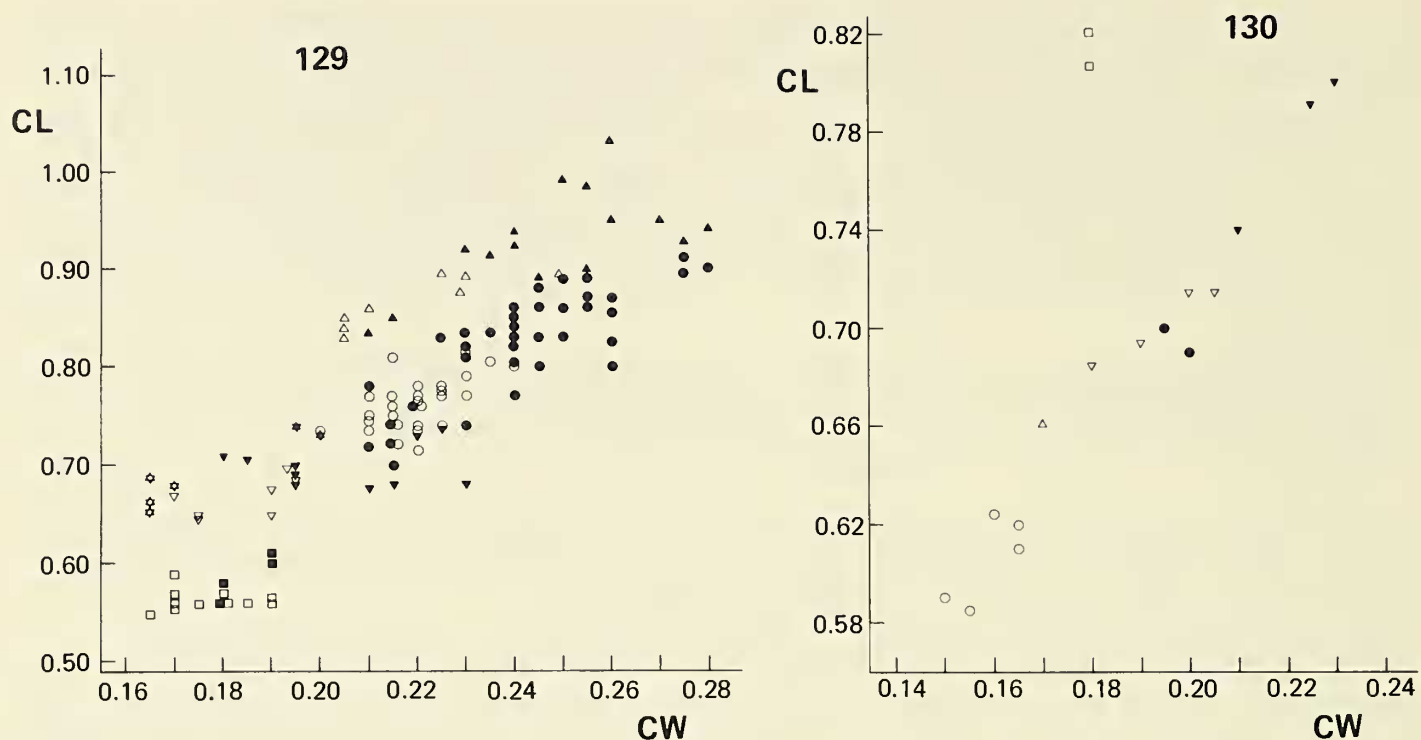
Sternophorellus araucariae Beier 1971:372-373, Fig. 3.

Types.—Holotype male, two chelae of paratype adult, Mt. Dayman, Milne Bay District, Papua New Guinea, under bark of *Araucaria cunninghamii*, 20 July 1969 (B. Gray), NHMW (spirit). The type series also contained two male and a female paratype which were not available for study.

Distribution.—Papua New Guinea (Map 6).

Diagnosis.—Male genitalia with long, acute, slightly curved dorsal apodemes. Chela (with pedicel) 4.47 to 4.56 (male) times longer than broad.

Description.—Male only. Pedipalpal trochanter 1.88, femur elongate, 3.34 to 3.55, tibia 2.58 to 2.84, chela (with pedicel) slender, 4.47 to 4.56, chela (without pedicel) 4.19 to 4.28 times longer than broad. Trichobothria as for *araucariae* group, in usual position (Fig. 131). Serrula exterior of chelicera with 10 lamellae. Galea of male simple. Carapace



Figs. 129-130.—Graphs of chela (with pedicel) length (CL) versus width (CW), in mm; open symbols, males; closed symbols, females: 129, *Afrosternophorus hirsti* (Chamberlin) (circles), *A. nanus*, new species (squares), *A. anabates*, new species (upright triangles), *A. papuanus* (Beier) (stars), *A. grayi* (Beier) (inverted triangles); 130, *A. araucariae* (Beier) (squares), *A. cavernae* (Beier) (triangle), *A. fallax*, new species (circles), *A. xalyx*, new species (inverted triangles).

slightly constricted (Fig. 132), with 23 setae; 1.41 times longer than broad. Male genitalia with long, acute, slightly curved dorsal apodemes; mid-piece of lateral rod small (Fig. 61). Tergal chaetotaxy: 6:5:4:5:6:6:6:6:6:T1T3T1T?:2. Sternal chaetotaxy: 0:5:(0)4[6](0):(1)4(1):7:6:7:7:7:T1T3T1T?:2. Coxal chaetotaxy: 4-5:3:3-5:4-5.

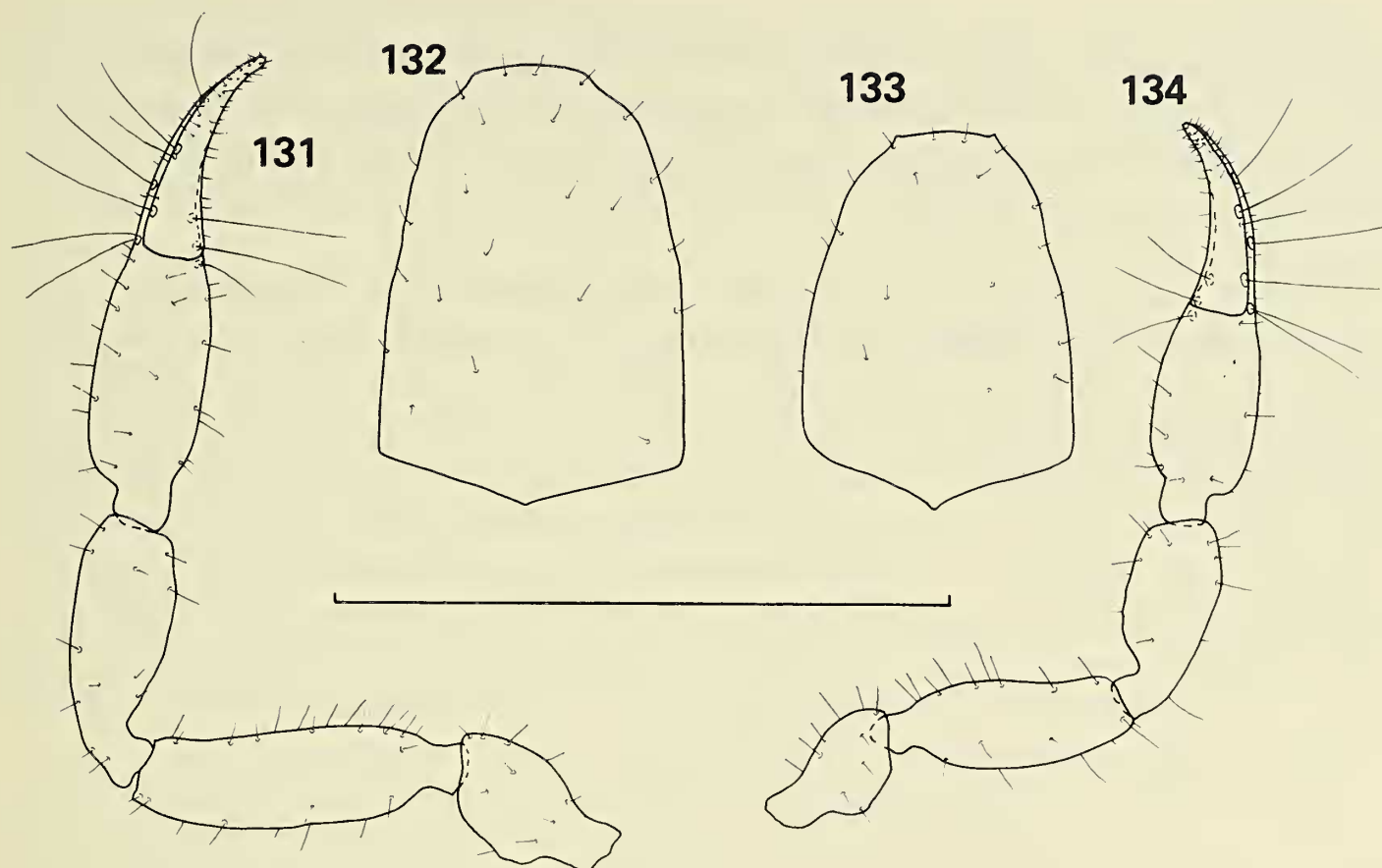
Dimensions (mm): Body length 2.2; pedipalps: trochanter 0.30/0.16, femur 0.535-0.55/0.155-0.16, tibia 0.425-0.44/0.155-0.165, chela (with pedicel) 0.805-0.82/0.18, chela (without pedicel) 0.755-0.77, moveable finger length 0.375-0.39; chelicera 0.16/0.095, moveable finger length 0.11-0.115; carapace 0.705/0.50; leg I: coxa 0.20/0.18, trochanter 0.12/0.085, femur I 0.105/0.105, femur II 0.175/0.105, tibia 0.185/0.07, tarsus ?/0.05; leg IV: coxa width 0.19, trochanter 0.16/0.095, femur I 0.175/0.145, femur II 0.26/0.145, tibia 0.30/0.09, tarsus 0.14/0.06.

Habitat.—The type specimens were taken from under bark of *Araucaria cunninghamii* (Beier 1971).

Remarks.—Beier originally described this species from three males and one female. The holotype male is deposited in NHMW, but the remaining specimens were probably returned to Dr. B. Gray of the Entomology Section, Department of Forests, Bulolo, Papua New Guinea. Repeated requests to this institution concerning the material have failed to elicit a response, and as a result, the female of *araucariae* remains unstudied. This is unfortunate since the form of the female genitalia is crucial in correctly assigning species to genus. Nevertheless, females of the closely related species *A. fallax* and *A. xalyx* possess the typical *Afrosternophorus* genitalia.

Two badly crushed, isolated chelae were present in the vial containing the holotype. They most probably belong to one of the aforementioned paratypes.

This species is easily distinguished from other species of the species group on the basis of its elongate pedipalps (Fig. 130).



Figs. 131-132.—*Afrosternophorus araucariae* (Beier), male holotype: 131, ventral aspect of right pedipalp; 132, dorsal aspect of carapace. Figs. 133-134.—*Afrosternophorus cavernae* (Beier), male paratype: 133, dorsal aspect of carapace; 134, ventral aspect of left pedipalp. Scale line = 1.00 mm.

Afrosternophorus cavernae (Beier), new combination

Figs. 62, 130, 133-134; Map 6

Sternophorellus cavernae Beier 1982:44-45, Fig. 1.

Types.—Holotype male, Selminum tem Cave [near Tifalmin], West Sepic District, Papua New Guinea, 1 November 1975 (P. Chapman), National Natural History Museum, Sofia (spirit), not examined. Paratype male, same data as above except 1 October 1975 (P. Beron), NHMW (spirit).

Distribution.—Papua New Guinea (Map 6).

Diagnosis.—Male genitalia with long, acute dorsal apodemes; mid-piece of lateral rod not elongate. Chela (with pedicel) 0.66 mm (male) in length.

Description.—Male only. Pedipalpal trochanter 1.92 to 2.00, femur 2.93 to 2.97, tibia 2.20 to 2.27, chela (with pedicel) 3.88, chela (without pedicel) 3.62 to 3.65 times longer than broad. Trichobothria as for *araucariae* group, in usual position (Fig. 134). Serrula exterior of chelicera with 12 lamellae. Galea of male simple. Carapace unconstricted (Fig. 133), with 20 setae; 1.39 times longer than broad. Male genitalia with long, acute dorsal apodemes; mid-piece of lateral rod small (Fig. 62). Tergal chaetotaxy: 7:6:6:6:6:7:6:7:8: T1T4T1T:?:2. Sternal chaetotaxy: ? Coxal chaetotaxy: ?

Dimensions (mm): Body length 1.7; pedipalps: trochanter 0.25-0.26/0.13, femur 0.425-0.43/0.145, tibia 0.33-0.34/0.15, chela (with pedicel) 0.66/0.17, chela (without pedicel) 0.615-0.62, moveable finger length 0.32-0.325; chelicera 0.135-0.14/0.08, moveable finger length 0.10; carapace 0.61/0.44; legs: ?.

Habitat.—The type specimens were taken from a cave, but it is not known whether or not this is simply fortuitous.

Remarks.—*Afrosterphorus cavernae* is very similar to *A. fallax* and the two species can be distinguished only on details of the male genitalia. Additional material of both species may yield subtle differences in pedipalpal morphometrics, but the paucity of specimens precludes such a study at the present time. Both of these species differ from *A. araucariae* by their stout pedipalps (Fig. 130), and from *A. xalyx* in possessing long dorsal apodemes.

Unfortunately, females of *A. cavernae* have not been available for study, but it is presumed that they will possess the genitalia typical of the remaining species of the genus. Females of the closely related species *A. fallax* and *A. xalyx* possess such genitalia.

The occurrence of this species in a cave is very surprising because all other sternophorid species (with known locality data) are corticolous. It does not display any troglotic adaptations such as attenuate appendages or unusually pale colouration and this cavernicolous record may be simply fortuitous. Selminum tem Cave is 20 km long (Moore 1978) and the locality data given by Beier (1982) or the data on the label of the paratype that I examined did not state from where in the cave system the specimens were taken. Further collections and more detailed observations on its biology are needed to support the alleged cavernicolous nature of the species.

Beier (1982) stated that Selminum tem Cave was situated in the Western District of Papua New Guinea. Although I cannot locate this cave on any maps or gazetteers at my disposal, Moore (1978) indicated that it is situated near the township of Tifalmin, which, in fact, is in the West Sepic District.

Afrosterphorus fallax, new species

Figs. 63, 76, 130, 135-138; Map 4

Sternophorus chamberlini Redikorzev: Beier 1951:71-72 (in part).

Types.—Holotype male, paratype male, paratype female, Plateau von Langbian [= Cao Nguyên Lâm Viên, see Table 1], Vietnam, 1938-1939 (C. Dawydoff), NHMW (spirit). Paratype male, same data as above, ANIC, MH431.01 (slide).

Etymology.—The specific epithet refers to this species being confused with *chamberlini* by Beier (*fallax* L. deceitful, false).

Distribution.—Vietnam (Map 4).

Diagnosis.—Male genitalia with long, acute dorsal apodemes; mid-piece of lateral rod elongate. Female galea with three distal to subdistal rami. Chela (with pedicel) 3.70 to 3.91 (male), 3.45 to 3.59 (female) times longer than broad.

Description.—Pedipalpal trochanter 1.68 to 1.88 (male), 1.86 to 1.89 (female), femur 2.88 to 3.08 (male), 2.83 to 2.90 (female), tibia 2.14 to 2.38 (male), 2.16 to 2.25 (female), chela (with pedicel) 3.70 to 3.91 (male), 3.45 to 3.59 (female), chela (without pedicel) 3.45 to 3.73 (male), 3.33 to 3.38 (female) times longer than broad. Trichobothria as for *araucariae* group, in usual position (Figs. 135-136). Serrula exterior of chelicera with 12 to 13 (male), 12 (female) lamellae. Galea of male simple, of female with three distal to subdistal rami (Fig. 76). Carapace unconstricted (Fig. 137), with 22 (male), 20 (female) setae; 1.33 to 1.41 (male), 1.45 (female) times longer than broad. Male with long, acute dorsal apodemes; mid-piece of lateral rod elongate (Fig. 63). Female genitalia as for genus (Fig. 138). Tergal chaetotaxy: male, 6:4-6:2:6:5-6:6:6:5-6:6:T1T3 T1T?:2; female, 6:5:2:6:6:6:6:6:6:T1T4T1T?:2. Sternal chaetotaxy: male, 0:4:(0)4[5-6](0):(1)4(1):6:6:6:6:6:T1T2-3T1T?:2; female, 0:5:(0)4(0):(1)4(1):6:6:6:6:6:T1T3 T1T?:2. Coxal chaetotaxy: male, 4-5:3-5:2-4:3-5; female, 5:4-5:3:3.

Dimensions (mm): Body length 1.5-1.7 (1.9); pedipalps: trochanter 0.21-0.235/0.12-0.125 (0.26-0.265/0.14), femur 0.375-0.385/0.125-0.13 (0.425/0.15), tibia 0.30-0.31/0.13-0.14 (0.345-0.36/0.16), chela (with pedicel) 0.585-0.625/0.15-0.165 (0.69-0.70/0.195-0.20), chela (without pedicel) 0.55-0.595 (0.66-0.665), moveable finger length 0.28-0.30 (0.32); chelicera 0.125-0.13/0.07-0.075 (0.145/0.08), moveable finger length 0.095-0.10 (0.105); carapace 0.56-0.58/0.41-0.42 (0.665/0.46); leg I: coxa 0.155/0.165 (0.18/0.195-0.20), trochanter 0.08-0.085/0.065 (0.095-0.10/0.07), femur I 0.09/0.075 (0.085/0.085), femur II 0.12/0.08 (0.135-0.14/0.085), tibia 0.13/0.055 (0.14/0.06), tarsus ?? (??); leg IV: coxa width 0.16-0.19 (0.195-0.21), trochanter 0.11-0.12/0.075-0.085 (0.14/0.085-0.09), femur I 0.14-0.165/0.11-0.115 (0.175-0.18/0.125-0.13), femur II 0.17-0.18/0.115-0.12 (0.21-0.215/0.13-0.135), tibia 0.19-0.20/0.07-0.075 (0.22-0.24/0.08-0.085), tarsus 0.105-0.13/0.045-0.05 (0.13/0.06).

Habitat.—No habitat data accompanied the specimens.

Remarks.—As discussed under *Afrosterphorus chamberlini*, Beier's (1951) description of that species was a composite of *chamberlini* and *fallax*. His male pedipalp measurements were of the latter, and his female measurements were of the former.

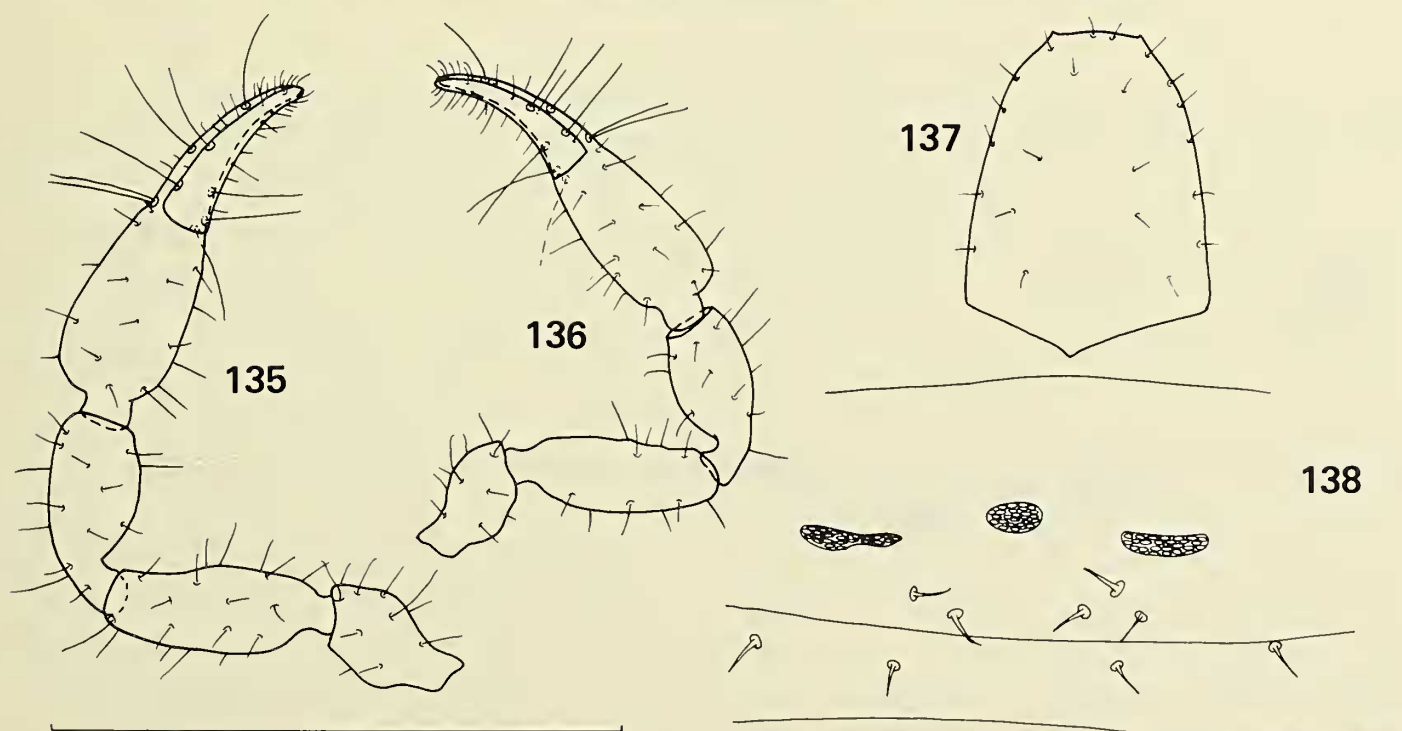
This species is very similar to the Papua New Guinean species *A. cavernae*. It may be distinguished from this species by the presence of a long mid-piece on the lateral rod of the male genitalia.

Afrosterphorus xalyx, new species

Figs. 64, 77, 130, 139-143; Map 5

Types.—Holotype male, two paratype males, four paratype females, Townsville, Queensland, Australia, under bark of eucalypt tree, date? (collector?), MV, K154-K160 (slides and spirit).

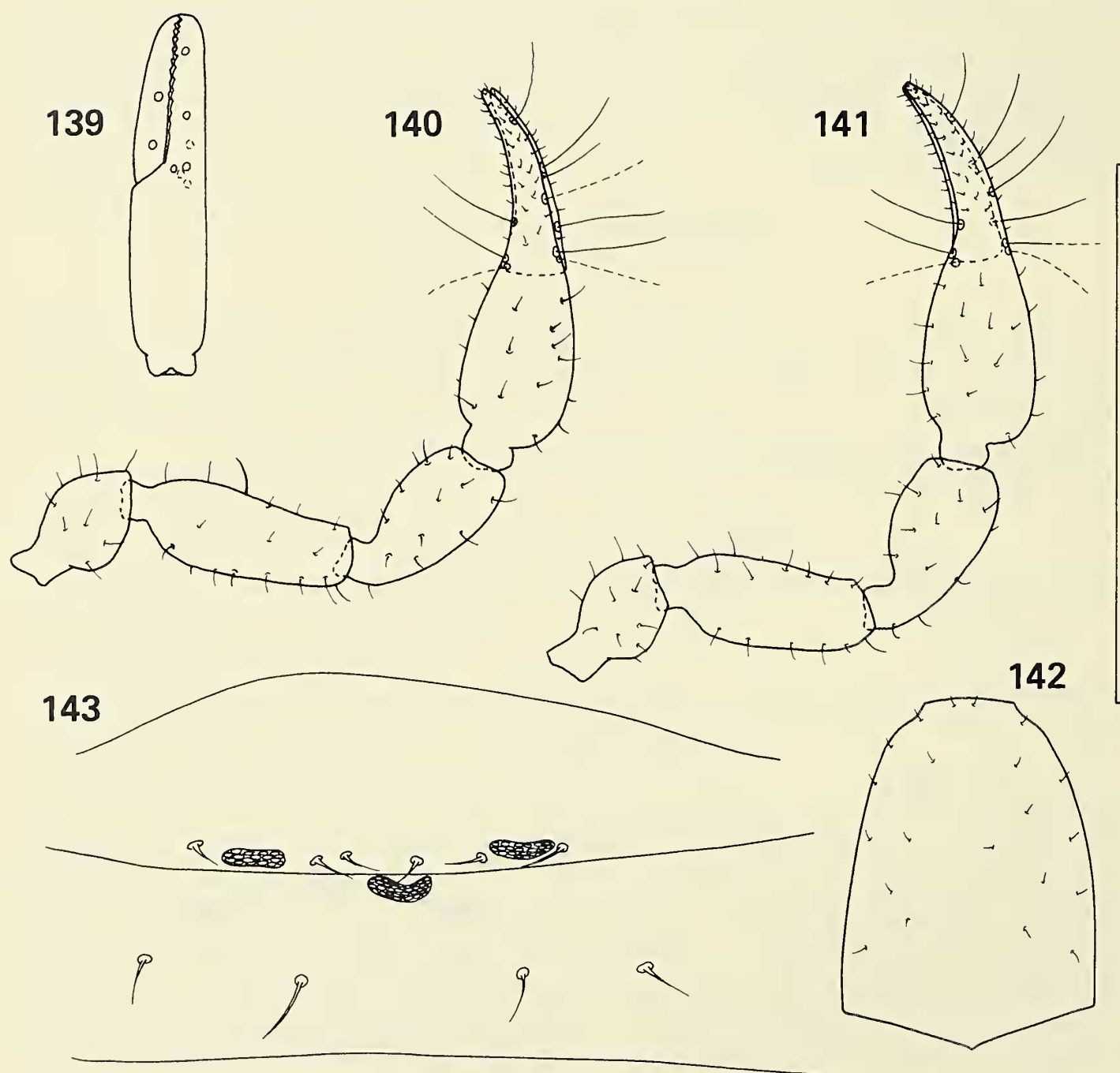
Etymology.—The specific epithet is an arbitrary combination of letters.



Figs. 135-138.—*Afrosterphorus fallax*, new species: 135, ventral aspect of right pedipalp, female paratype; 136, ventral aspect of left pedipalp, male holotype; 137, dorsal aspect of carapace, male holotype; 138, female genitalia and associated sternites, paratype. Scale line = 1.00 mm (Figs. 135-137), 0.25 mm (Fig. 138).

Diagnosis.—Male genitalia with reduced dorsal apodemes; mid-piece of lateral rod with distinct posterior notch. Female galea with two distal and four subdistal to subbasal rami. Chela (with pedicel) 0.685 to 0.72 (male), 0.74 to 0.79 mm (female) in length, 3.49 to 3.81 (male), 3.43 to 3.52 (female) times longer than broad.

Description.—Pedipalpal trochanter 1.61 to 1.89 (male), 1.67 to 1.81 (female), femur 2.64 to 2.93 (male), 2.71 to 2.94 (female), tibia 2.03 to 2.25 (male), 2.08 to 2.24 (female), chela (with pedicel) 3.49 to 3.81 (male), 3.43 to 3.52 (female), chela (without pedicel) 3.32 to 3.58 (male), 3.26 to 3.38 (female) times longer than broad. Trichobothria as for *araucariae* group, in usual position (Figs. 139-141). Serrula exterior of chelicera with 12 to 13 (male), 12 (female) lamellae. Galea of male simple, of female with two distal and four subdistal to subbasal rami (Fig. 77). Carapace not constricted (Fig. 142) with 16 to 19 (male), 21 to 23 (female) setae; 1.30 to 1.37 (male), 1.20 to 1.34 (female) times longer than broad. Male genitalia with reduced dorsal apodemes; midpiece of lateral rod with a distinct posterior notch (Fig. 64). Female genitalia as for genus (Fig.



Figs. 139-143.—*Afrosterophorus xalyx*, new species: 139, lateral aspect of left chela, male paratype, K155; 140, dorsal aspect of right pedipalp, male holotype; 141, same, female paratype, K157; 142, dorsal aspect of carapace, female paratype, K157; 143, female genitalia and associated sternites, paratype, K157. Scale line = 1.00 mm (Figs. 139-142), 0.25 mm (Fig. 143).

143). Tergal chaetotaxy: male, 5-6:6-7:5-6:6-8:6-8:5-8:6-7:6-8:6:T1T4T1T:?:2; female, 6-7:6-8:4:6:6-7:6-7:6-7:6:6-8:T1T4-5T1T:?:2. Sternal chaetotaxy: male, 0:4-7:(0)4[10-12](0):(1)4-5(1):6:6:6-7:6-8:6:T1T3-4T1T:?:2; female, 0:8:(0)4(0):(1)4-6(1):6-8:6-8:5-6:5-6:5-7:T1T3-4T1T:?:2. Coxal chaetotaxy: male, 3-4:4-5:3-5:4; female, 3-4:4-6:4-6:3-4.

Dimensions (mm): Body length 1.6-1.8 (1.7-2.5); pedipalps: trochanter 0.25-0.265/0.135-0.155 (0.265-0.295/0.155-0.17), femur 0.42-0.455/0.145-0.165 (0.45-0.50/0.16-0.18), tibia 0.345-0.375/0.155-0.17 (0.375-0.405/0.17-0.19), chela (with pedicel) 0.685-0.72/0.18-0.205 (0.74-0.79/0.21-0.23), chela (without pedicel) 0.645-0.69 (0.70-0.76), moveable finger length 0.34-0.365 (0.375-0.405); chelicera 0.13-0.145/0.07-0.08 (0.155-0.16/0.085-0.10), moveable finger length 0.10 (0.11-0.12); carapace 0.635-0.67/0.48-0.49 (0.66-0.73/0.52-0.61); leg I: coxa 0.18-0.21/0.19-0.205 (0.20-0.21/0.23-0.25), trochanter 0.095-0.105/0.07 (0.125/0.09), femur I 0.09-0.095/0.115-0.12 (0.105/0.13-0.135), femur II 0.155-0.16/0.11-0.12 (0.18/0.08), tibia 0.175-0.18/0.05-0.075 (0.19/0.08), tarsus 0.13/0.05 (0.13-0.14/0.05-0.06); leg IV: coxa width 0.21-0.22 (0.235-0.24), trochanter 0.135-0.145/0.10 (0.155/0.11), femur I 0.155-0.165/0.175-0.18 (0.175-0.185/0.175-0.19), femur II 0.22-0.23/0.175-0.18 (0.23-0.255/0.18-0.205), tibia 0.29/0.09-0.10 (0.30-0.31/0.105-0.12), tarsus 0.165/0.06 (0.17-0.18/0.06-0.07).

Habitat.—The specimens were taken from “under bark of eucalypt tree”.

Remarks.—Even though the type specimens are in poor condition, there can be no doubt that they represent a new and distinct species of the *araucaariae* group.

Males of *A. xalyx* differ from the other three species of the *araucaariae* group in possessing reduced dorsal apodemes, and females differ from *A. fallax* (the only other species of the group in which females are known) by possessing more galeal rami. In addition, *A. xalyx* is slightly larger (Fig. 130).

A second label with the specimens reads “presented by G. F. Hill 24/4/23”.

EVOLUTION

A speculative phylogeny of the three sternophorid genera, and their species or groups, is presented in Fig. 144. Table 3 summarizes the characters utilized in the cladogram. The techniques advocated by Hennig (1965, 1966) for cladogram construction were used.

1. Female median cribriform plate(s). Even though data for many genera are lacking, most genera of all of the monosphyronid families (with the exception of the Pseudogarypidae, whose female genitalia are unknown) possess only one median cribriform plate. Exceptions that possess two plates include most Cheliferini (Chamberlin 1932b), the chernetids *Metagoniochernes milloti* Vachon (Vachon 1951) and *Lamprochernes* sp. (pers. obs.) and the two sternophorid genera *Garyops* and *Idiogaryops*. *Neocheiridium africanum* Mahnert and *N. pusillum* Mahnert (Cheiridiidae) possess three such plates (Mahnert 1982a), as do some females of *Idiogaryops paludis* (Hoff 1963). Chamberlin (1952) stated that two plates represent the primitive condition, and that several independent fusions have occurred to form one plate. If this is so, then fusion has occurred in all of the monosphyronid families; the alternative hypothesis is preferred here because this involves a minimum of only four changes within the suborder (one each in the Sternophoridae and Cheiridiidae, and one or more in the Cheliferidae and Chernetidae).

Thus, the character state displayed by the genus *Afrosteronophorus* is thought to be plesiomorphic, and the character state displayed by *Garyops* and *Idiogaryops* is assumed to be apomorphic.

Table 3.—Characters used in the construction of the cladogram of the Sternophoridae (Fig. 144).

Character	Plesiomorphic state	Apomorphic state
1. Female median cribriform plate(s)	1	2
2. Female median cribriform plate(s)	without spurs	with spurs
3. Trichobothria of moveable chelal finger	3	2
4. Trichobothria of moveable chelal finger	3	2

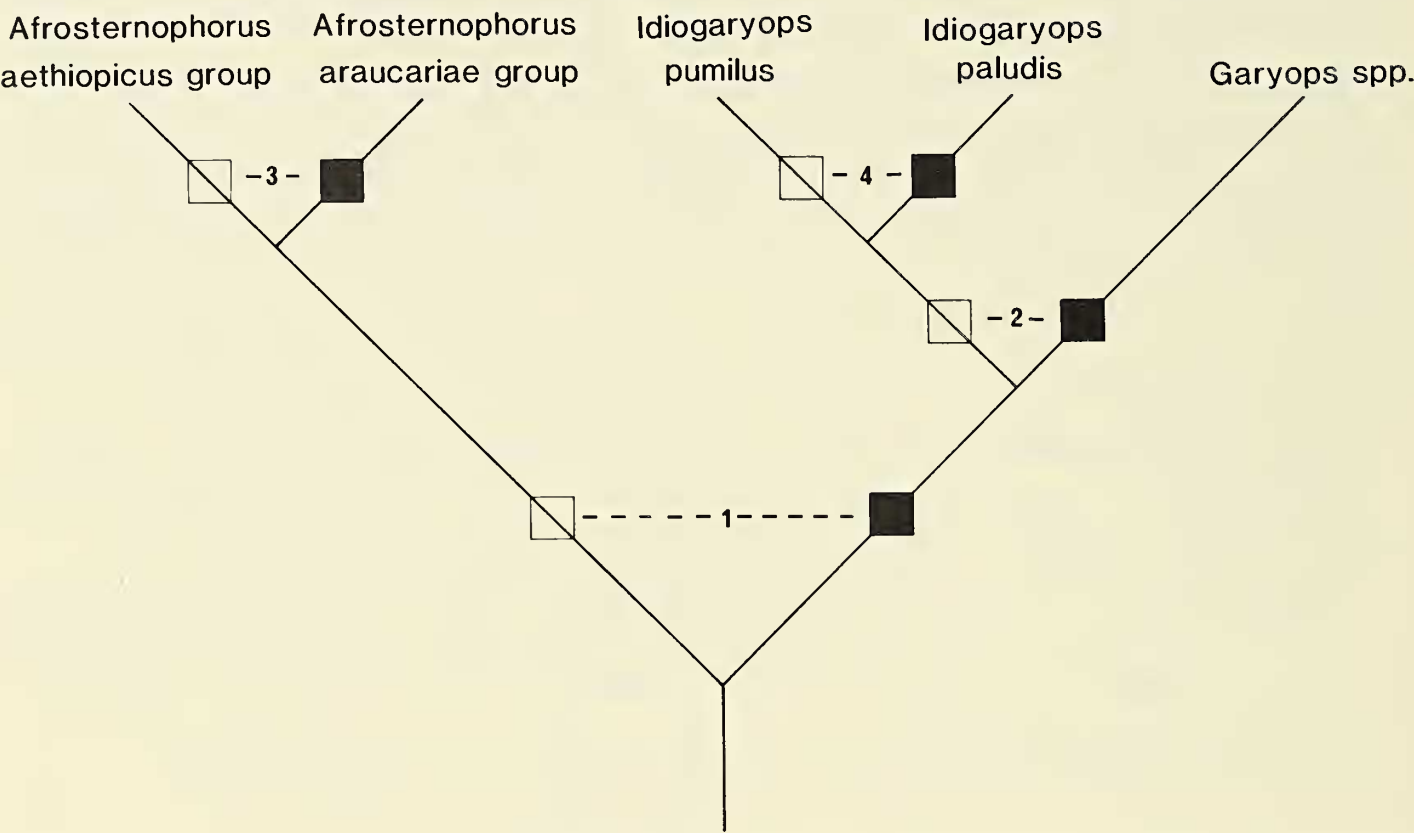


Fig. 144.—Cladogram of the Sternophoridae: open squares, plesiomorphic character states; closed squares, apomorphic character states.

2. Female median cribriform plates(s). Lateral spurs on the median cribriform plates are unique within the Pseudoscorpionida, and undoubtedly represent an autapomorphy for *Garyops*.

3. and 4. Trichobothria of moveable chelal finger. Because most pseudoscorpions possess 8/4 (i.e., eight trichobothria on the fixed chelal finger and four trichobothria on the moveable chelal finger), it is assumed that this is the most plesiomorphic condition within the order. If a lower number is considered to be the primitive state, then one must postulate a series of independent additions to the trichobothriotaxies of all of the pseudoscorpion families. If 8/4 is the primitive condition, then one need only assumed that reductions have occurred independently in a few families, such as the Garypidae, Olpiidae, Neobisiidae, Sternophoridae, Cheiridiidae and Chernetidae. The highest number in the Sternophoridae is 7/3 and this is regarded as the plesiomorphic condition for the family. Deviations from this pattern are known in five species of two genera (*A. araucariae*, *A. cavernae*, *A. fallax*, *A. xalyx* and *I. paludis*) where each species lacks the trichobothrium *sb* of the moveable chelal finger. This is considered to be apomorphic. Since it has occurred in two separate genera, it obviously represents an interesting case of parallelism.

This loss of a trichobothrium appears to be neotenic, since the tritonymphs of the 7/3 species possess 7/2 trichobothria and once again *sb* is absent. Thus, it is not so much a case of “losing” a trichobothrium, but of having a trichobothrium fail to appear in the post-embryonic development of a species. Developmental data on these species with reduced trichobothriotaxies are completely lacking.

The analysis of phylogenetic trends within the genera *Garyops* and *Afrosterphorus*, especially the large *A. aethiopicus* group, is an extremely difficult task which has not been attempted. This is mainly due to a series of apomorphic character states whose sequence in time are virtually impossible to interpret. They are only briefly summarized here: *G. centralis* (increased number of female galeal rami), *A. aethiopicus* (reduction of dorsal apodeme), *A. ceylonicus* (reduction of dorsal apodeme; decreased number of galeal rami), *A. chamberlini* (midpiece of lateral rod elongate; increased number of female galeal rami), *A. hirsti* (reduction of dorsal apodeme; anterior apodeme brush-like), *A. anabates* (anterior apodeme distally broad; often phoretic on sparassid spiders), *A. papuanus* (anterior apodeme distally broad), *A. fallax* (midpiece of lateral rod elongate) and *A. xalyx* (dorsal apodemes reduced). *Afrosterphorus anabates* and *A. papuanus* are synapomorphic sister-species that are united by the presence of a distally broad anterior apodeme.

Since *Afrosterphorus* and *Idiogaryops* are not based upon apomorphic character states, and are defined by plesiomorphies, the possibility exists that they are paraphyletic. Nevertheless, at the expense of a strict cladistic classification where such groups would not be recognized, I have retained the three generic names because they are useful labels denoting distinct differences in the female genitalia.

BIOGEOGRAPHY

The Sternophoridae is currently distributed in most parts of the world (Maps 1-6), but it appears to conform quite readily to a “trans-antarctic” pattern, and may have had its origins in Gondwanaland. Nevertheless, anomalies occur which need clarification before definite statements may be made. These include:

(1) The absence of Neotropical records: If it is assumed that sternophorids originated in Gondwanaland, then there are two hypotheses that may be presented to explain their absence from South America: (a) they are extinct, or (b) they have yet to be collected. I consider that the latter is the most plausible hypothesis since sternophorids are small, pale, corticolous pseudoscorpions that, unless specifically searched for, are difficult to find.

(2) Presence in Laurasia (North America): Many “Gondwanaland” organisms invaded North America from South America when those two continents joined during the Cretaceous (Dietz and Holden 1970). Thus, it is not particularly surprising to find that at least one pseudoscorpion group has undertaken a similar journey. Others apparently include the Pseudogarypidae, Garypidae, Tridenchthoniidae and Atemnidae.

(3) Presence in Indo-China: This apparent anomaly may be explained by two models. The first assumes that migration occurred from India after that subcontinent became attached to Asia during the Cretaceous (Dietz and Holden 1970), and the second has its foundations in recent studies which have shown that various portions of south-east Asia may have been an integral part of Gondwanaland (Burton 1970, Ridd 1971, Crawford 1974, Stauffer 1974, Cooper 1980 and others), possibly lying between India and Australia (Ridd 1971).

The presence of *Idiogaryops pumilus* on Little Cayman Island in the Caribbean is also quite interesting. Perfit and Heezen (1978) hypothesized that during the Miocene, localized uplift elevated the Cayman Islands (among others) above sea level. This suggests that *I. pumilus* arrived on Little Cayman Island by phoresy or rafting subsequent to the island's appearance.

It is of interest to note that two sister-species united by a single synapomorphy, *Afrosterphorus anabates* and *A. papuanus*, are geographically isolated, the former in south-eastern Australia (Map 5) and the latter in Papua New Guinea (Map 6). New Guinea (which includes Papua New Guinea and Irian Jaya) is now firmly considered to be an integral part of the Australian continent (Nix 1982), and the two countries are thought to have separated during the Eocene or Pliocene (Doutch 1972).

It is of interest to note the congruence between the generic classification proposed in this study and the biogeography of each of the genera. *Garyops* and *Idiogaryops* are found only in the New World and are more closely related to each other than to *Afrosterphorus*.

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